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July 31, 2009

Dataset Integrity Check for the DCCT-EDIC Study on Coronary Artery Calcification using Computed Tomography (CT) scans [CT Scan Study]

The Data Coordinating Center (DCC) of the DCCT-EDIC Research Group submitted an analysis dataset to the NIDDK Data Repository, pertaining to the *Diabetes Vol.55 [2006]* publication, "The Effect of Intensive Glycemic Treatment on Coronary Artery Calcification in Type I Diabetic Participants of the Diabetes Control and Complications Trial/Epidemiology of Diabetes Interventions and Complications (DCCT/EDIC) Study" [1]. As a partial check of the integrity of this DCCT-EDIC dataset archived in the NIDDK data repository, a dataset integrity check (DSIC) was performed to verify that selected published results from this study could be reproduced using the archived dataset. Results of the DSIC are described below.

The intent of this DSIC is to provide confidence that the data distributed by the NIDDK repository is a true copy of the study data. Our intent is ***not*** to assess the integrity of the statistical analyses reported by study investigators. As with all statistical analyses of complex datasets, complete replication of a set of statistical results should not be expected on a first (or second) exercise in secondary analysis. This occurs for a number of reasons including differences in the handling of missing data, restrictions on cases included in samples for a particular analysis, software coding used to define complex variables, etc. Experience suggests that most discrepancies can ordinarily be resolved by consultation with the study DCC, however this process is labor-intensive for both DCC and Repository staff. It is thus not our policy to resolve every discrepancy that is observed in an integrity check. Thus, we do not attempt to resolve minor or inconsequential discrepancies with published results or discrepancies that involve complex analyses unless staff of the NIDDK Repository suspect that the observed discrepancy suggests that the dataset may have been corrupted in storage, transmission, or processing by repository staff. We do, however, document in footnotes to the integrity check those instances in which our secondary analyses produced results that were not fully consistent with those reported in the target publication.

DSIC Methods. A portion of the analyses were selected for replication to assure the archived dataset is a true copy of the one analyzed for Publication. The methods of analysis emulated those described in the Publication text. *PC-SAS* was used for all DSIC analysis.

DSIC Results. In this study, Coronary Artery Calcification (CAC) was measured as an index of atherosclerosis using computed tomography (CT) scans in 1205 DCCT/EDIC patients, 7-9 years after DCCT close. Tables 1a and 1b of this DSIC compares published patient characteristics to results obtained from analyses of the archived SAS dataset. The counts, percentages, means, and standard deviations obtained from analyses of the archived data closely matched published tabulations. Observed differences are easily attributable to rounding error [Tables 1a, 1b].

Table 1a. Clinical characteristics of participants in CT scan study by sex and DCCT treatment assignment: Female subjects

	Intensive						Conventional					
	Archived		Published*		Difference		Archived		Published*		Difference	
n	297		297		(0)		275		275		(0)	
Age at entry into DCCT (years)	27	(7)	27	(7)	0	(0)	26	(7)	26	(7)	0	(0)
DCCT follow-up (years)	6.4	(1.7)	6.4	(1.7)	0.0	(0.0)	6.3	(1.7)	6.3	(1.7)	0	(0.0)
EDIC follow-up (years)	9.2	(0.5)	9.2	(0.5)	0.0	(0.0)	9.1	(0.5)	9.1	(0.5)	0	(0.0)
DCCT baseline												
Retinopathy (negative) (%)	51		51		(0)		49		49		(0)	
Albumine excretion rate	16	(20)	16	(20)	0	(0)	15	(13)	15	(13)	0	(0)
Diabetes Duration (months)	69	(50)	69	(50)	0	(0)	71	(51)	71	(51)	0	(0)
Visit prior to or at time of CT scan												
Age (years)	43	(7)	43	(7)	0	(0)	42	(7)	42	(7)	0	(0)
Current smokers (%)	15		15		(0)		13		14		(1)	
Diabetes Duration (years)	21	(5)	21	(5)	0	(0)	21	(5)	21	(5)	0	(0)
BMI (kg/m^2)	27	(5)	28	(5)	1	(0)	27	(4)	27	(5)	0	(1)
Waist-to-hip ratio	0.79	(0.07)	0.79	(0.07)	0	(0.00)	0.78	(0.06)	0.78	(0.06)	0	(0.00)
Ankle-to-arm blood pressure ratio <0.9 (%)	14		15		(1)		12		12		(0)	
Systolic blood pressure (mm Hg)	120	(14)	120	(14)	0	(0)	120	(15)	120	(15)	0	(0)
Diastolic blood pressure (mm Hg)	75	(9)	75	(9)	0	(0)	74	(9)	74	(9)	0	(0)
Hypertension (%)	29		29		(0)		36		36		(0)	
Aspirin ≥ 14 pills/mo (%)	22		22		(0)		25		25		(0)	
Menopause (%)	26		26		(0)		21		21		(0)	
One or both parents with type 2 diabetes (%)	20		20		(0)		15		15		(0)	
Carotid IMT year 6[a]	0.60	(0.11)	0.60	(0.11)	0.00	(0.00)	0.59	(0.10)	0.59	(0.10)	0.00	(0.00)
Lipids												
Total cholesterol (mmol/l)	4.94	(0.96)	4.94	(0.96)	0.00	(0.00)	4.83	(0.84)	4.83	(0.84)	0.00	(0.00)
HDL (mmol/l)	1.59	(0.38)	1.59	(0.38)	0.00	(0.00)	1.62	(0.38)	1.62	(0.38)	0.00	(0.00)
LDL (mmol/l)	2.89	(0.76)	2.89	(0.76)	0.00	(0.00)	2.81	(0.69)	2.81	(0.69)	0.00	(0.00)
LDL-to-HDL ratio	1.9	(0.8)	1.9	(0.8)	0.0	(0.0)	1.8	(0.6)	1.8	(0.6)	0.0	(0.0)
Triglyceride (mmol/l)	0.95	(0.64)	0.95	(0.64)	0.00	(0.00)	0.89	(0.58)	0.89	(0.58)	0.00	(0.00)
Hypercholesterolemia (%)	30		30		(0)		29		29		(0)	
Renal												
Albumin excretion rate (mg/24 h)	36	(194)	36	(194)	0	(0)	84	(371)	84	(370)	0	(-1)
Albumin excretion rate >40 mg/24 h (%)	9		9		(0)		18		18		(0)	
A1C												
DCCT eligibility	9.2	(1.6)	9.2	(1.6)	0.0	(0.0)	9.1	(1.7)	9.1	(1.7)	0.0	(0.0)
Mean during DCCT	7.3	(0.9)	7.3	(0.9)	0.0	(0.0)	9.1	(1.4)	9.1	(1.4)	0.0	(0.0)
DCCT closeout	7.3	(1.0)	7.3	(1.0)	0.0	(0.0)	9.1	(1.8)	9.1	(1.8)	0.0	(0.0)
Mean during EDIC	8.1	(1.2)	8.1	(1.2)	0.0	(0.0)	8.1	(1.2)	8.1	(1.2)	0.0	(0.0)
At visit prior to CT	8.0	(1.4)	8.0	(1.4)	0.0	(0.0)	7.9	(1.5)	7.9	(1.5)	0.0	(0.0)
Mean during DCCT/EDIC	7.8	(0.9)	7.8	(0.9)	0.0	(0.0)	8.5	(1.1)	8.5	(1.1)	0.0	(0.0)

* Cleary PA, et.al, *Diabetes* Vol. 55 [2006], Table 1, p. 3558.

[a] This is common carotid IMT, per E-mail communication with the DCC 06/24/09

Table 1b. Clinical characteristics of participants in CT scan study by sex and DCCT treatment assignment: Male subjects

	Intensive						Conventional					
	Archived		Published*		Difference		Archived		Published*		Difference	
N	300		300		(0)		333		333		(0)	
Age at entry into DCCT (years)	28	(7)	28	(7)	**0**	**(0)**	28	(7)	28	(7)	**0**	**(0)**
DCCT follow-up (years)	6.4	(1.7)	6.4	(1.7)	**0.0**	**(0.0)**	6.1	(1.6)	6.1	(1.6)	**0**	**(0.0)**
EDIC follow-up (years)	9.1	(0.5)	9.1	(0.5)	**0.0**	**(0.0)**	9.2	(0.5)	9.2	(0.5)	**0**	**(0.0)**
DCCT baseline												
Retinopathy (negative) (%)	46		46		(0)		53		54		(1)	
Albumine excretion rate	17	(21)	17	(21)	**0**	**(0)**	15	(20)	15	(20)	**0**	**(0)**
Diabetes Duration (months)	70	(50)	70	(50)	**0**	**(0)**	60	(46)	60	(46)	**0**	**(0)**
Visit prior to or at time of CT scan												
Age (years)	43	(7)	43	(7)	**0**	**(0)**	43	(7)	43	(7)	**0**	**(0)**
Current smokers (%)	17		18		(1)		14		15		(1)	
Diabetes Duration (years)	21	(5)	21	(5)	**0**	**(0)**	20	(5)	20	(5)	**0**	**(0)**
BMI (kg/m^2)	28	(4)	28	(4)	**0**	**(0)**	28	(4)	28	(4)	**0**	**(0)**
Waist-to-hip ratio	0.91	(0.06)	0.91	(0.06)	**0.00**	**(0.00)**	0.90	(0.06)	0.90	(0.06)	**0.00**	**(0.00)**
Ankle-to-arm blood pressure ratio <0.9 (%)	7		7		(0)		8		8		(0)	
Systolic blood pressure (mm Hg)	123	(14)	123	(13)	**0**	**(-1)**	125	(15)	125	(15)	**0**	**(0)**
Diastolic blood pressure (mm Hg)	78	(9)	78	(9)	**0**	**(0)**	78	(10)	78	(10)	**0**	**(0)**
Hypertension (%)	35		35		(0)		46		46		(0)	
Aspirin $\geq$ 14 pills/mo (%)	26		26		(0)		33		33		(0)	
One or both parents with type 2 diabetes (%)	17		17		(0)		19		19		(0)	
Carotid IMT year 6[b]	0.63	(0.10)	0.63	(0.10)	**0.00**	**(0.00)**	0.65	(0.14)	0.65	(0.14)	**0.00**	**(0.00)**
Lipids												
Total cholesterol (mmol/l)	4.81	(0.90)	4.81	(0.90)	**0.00**	**(0.00)**	4.73	(0.85)	4.73	(0.85)	**0.00**	**(0.00)**
HDL (mmol/l)	1.31	(0.35)	1.31	(0.35)	**0.00**	**(0.00)**	1.32	(0.30)	1.32	(0.30)	**0.00**	**(0.00)**
LDL (mmol/l)	2.98	(0.76)	2.98	(0.76)	**0.00**	**(0.00)**	2.92	(0.74)	2.92	(0.74)	**0.00**	**(0.00)**
LDL-to-HDL ratio	2.4	(0.9)	2.4	(0.9)	**0.0**	**(0.0)**	2.3	(0.8)	2.3	(0.8)	**0.0**	**(0.0)**
Triglyceride (mmol/l)	1.15	(0.88)	1.15	(0.88)	**0.00**	**(0.00)**	1.06	(0.61)	1.06	(0.61)	**0.00**	**(0.00)**
Hypercholesterolemia (%)	44		44		(0)		40		40		(0)	
Renal												
Albumin excretion rate (mg/24 h)	105	(731)	105	(731)	**0**	**(0)**	234	(863)	234	(863)	**0**	**(0)**
Albumin excretion rate >40 mg/24 h (%)	13		13		(0)		26		26		(0)	
A1C												
DCCT eligibility	9.0	(1.6)	9.0	(1.6)	**0.0**	**(0.0)**	8.8	(1.6)	8.8	(1.6)	**0.0**	**(0.0)**
Mean during DCCT	7.2	(0.9)	7.2	(0.9)	**0.0**	**(0.0)**	8.9	(1.1)	8.9	(1.1)	**0.0**	**(0.0)**
DCCT closeout	7.4	(1.1)	7.4	(1.1)	**0.0**	**(0.0)**	9.1	(1.3)	9.1	(1.3)	**0.0**	**(0.0)**
Mean during EDIC	8.0	(1.1)	8.0	(1.1)	**0.0**	**(0.0)**	8.2	(1.1)	8.2	(1.1)	**0.0**	**(0.0)**
At visit prior to CT	7.9	(1.2)	7.9	(1.2)	**0.0**	**(0.0)**	7.9	(1.3)	7.9	(1.3)	**0.0**	**(0.0)**
Mean during DCCT/EDIC	7.7	(1.0)	7.7	(1.0)	**0.0**	**(0.0)**	8.5	(1.0)	8.5	(1.0)	**0.0**	**(0.0)**

* Cleary PA, et.al, *Diabetes,* Vol. 55 [2006], Table 1, p. 3558.

[b] This is common carotid IMT, per E-mail communication with the DCC 06/24/09

Correlation between CAC and Coronary Artery Disease risk factors. The Publication reports univariate Spearman rank correlations assessing the association between covariates and the prevalence of CAC>0 Agatston units, CAC>200 Agatston units, and log CAC. Analyses are partially adjusted for DCCT baseline age and sex. Table 2 of this DSIC compares results of adjusted rank correlations performed on archived data with published results.

In general, published correlation coefficients and P-values match results of correlation analyses on archived data. However, analyses of archived data resulted in minor differences with published results which were confirmed to be due to minor inconsistencies in data reporting. For example, the published correlation between sex ("male vs. female") and log CAC is -0.21; whereas the said correlation was found to be +0.21 upon analyzing the legacy data file. It was determined the inconsistency stemmed from the reversal of the coding for sex for the published analysis, despite indications in the labeling.[c]

Minor reporting inconsistencies are also noted across tables. The IMT variable reported in the Publication's Table 2, though correctly labeled as "Combined Carotid IMT Year 6", was found not to be the same variable as that reported in the Publication's Table 1, which is labeled as "Carotid IMT at Year 6." It was later confirmed the variable reported in the Publication's Table 1 is Common IMT at Year 6, which is distinct from Combined IMT.[d]

Finally, it is noted that recent clinical measurements are derived from the "Visit prior to or at time of CT scan" in the Publication's Table 1, and from "Most recent measure prior to CT scan" in the Publication's Table 2. Despite slight differences in description, analyses of archived data revealed the same measures are analyzed in both tables.[e]

Conclusion. Selected analysis of the CT scan analysis dataset closely replicates results reported by the DCCT-EDIC investigators in *Diabetes* (2006), aside from small inconsistencies in published data reporting. These results provide confidence that the analysis dataset distributed by the NIDDK Repository is a true copy of the CT scan analysis dataset.

[c] Confirmed by the DCC via *E*-mail, 07/27/09
[d] The DCC confirmed on 06/24/09 the Carotid IMT variable reported on in the publication's Table 1 is common carotid IMT.
[e] Specifically, it was confirmed recent measures were derived from the visit prior to, or at time of, CT scan.

Table 2. Partial Spearman rank correlation between CAC and covariates

	CAC >0					CAC >200				
	Archived		Published*		Difference	Archived		Published*		Difference
	Coeff	*P* value	Coeff	*P* value	in coefficients	Coeff	*P* value	Coeff	*P* value	in coefficients
Attained age	0.32	<0.0001	0.32	<0.0001	**0.00**	0.25	<0.0001	0.25	<0.0001	**0.00**
Sex (male versus female)	0.21	<0.0001	0.21	<0.0001	**0.00**	0.11	<0.0001	0.11	<0.0001	**0.00**
Smoking (yes/no)	0.13	<0.0001	0.13	<0.0001	**0.00**	0.12	<0.0001	0.12	<0.0001	**0.00**
DCCT baseline										
Retinopathy (yes/no)	0.11	0.0001	0.11	0.0001	**0.00**	0.09	0.003	0.09	0.003	**0.00**
Albumine excretion rate	0.09	0.003	0.09	0.003	**0.00**	0.07	0.012	0.07	0.012	**0.00**
Duration	0.11	0.0002	0.11	0.0002	**0.00**	0.08	0.007	0.08	0.007	**0.00**
Age	0.28	<0.0001	0.28	<0.0001	**0.00**	0.22	<0.0001	0.22	<0.0001	**0.00**
DCCT follow-up years	0.19	<0.0001	0.19	<0.0001	**0.00**	0.14	<0.0001	0.14	<0.0001	**0.00**
EDIC follow-up years	0.01	0.693	0.01	0.693	**0.00**	0.03	0.282	0.03	0.282	**0.00**
Most recent measure prior to CT scan										
Duration	0.16	<0.0001	0.16	<0.0001	**0.00**	0.13	<0.0001	0.13	<0.0001	**0.00**
Weight	0.02	0.512	0.02	0.512	**0.00**	0.02	0.424	0.02	0.424	**0.00**
Height	-0.04	0.185	-0.04	0.185	**0.00**	0.08	0.005	0.08	0.005	**0.00**
BMI	0.03	0.235	0.03	0.235	**0.00**	0.02	0.518	0.02	0.518	**0.00**
Waist-to-hip ratio	0.14	<0.0001	0.14	<0.0001	**0.00**	0.08	0.006	0.08	0.006	**0.00**
Ankle-to-arm ratio	-0.04	0.125	-0.04	0.125	**0.00**	-0.09	0.002	-0.09	0.002	**0.00**
HDL	-0.10	0.001	-0.10	0.001	**0.00**	-0.06	0.056	-0.06	0.056	**0.00**
LDL	0.02	0.535	0.02	0.535	**0.00**	0.01	0.791	0.01	0.791	**0.00**
Total cholesterol	<0.01	0.981	<0.01	0.981	**0.00**	0.01	0.627	0.01	0.627	**0.00**
LDL-to-HDL ratio	0.08	0.007	0.08	0.007	**0.00**	0.03	0.307	0.03	0.307	**0.00**
Triglyceride	0.07	0.015	0.07	0.015	**0.00**	0.07	0.013	0.07	0.012	**0.00**
Hypercholesterolemia (yes/no)	0.13	<0.0001	0.13	<0.0001	**0.00**	0.11	<0.0001	0.11	<0.0001	**0.00**
Systolic blood pressure	0.06	0.039	0.06	0.040	**0.00**	0.07	0.019	0.07	0.020	**0.00**
Diastolic blood pressure	-0.03	0.291	-0.03	0.291	**0.00**	0.02	0.503	0.02	0.500	**0.00**
Hypertension (yes/no)	0.12	<0.0001	0.12	<0.0001	**0.00**	0.12	<0.0001	0.12	<0.0001	**0.00**
Albumin excretion rate >40 (yes/no)	0.09	0.003	0.09	0.003	**0.00**	0.12	<0.0001	0.12	<0.0001	**0.00**
Combined carotid IMT year 6	0.16	<0.0001	0.16	<0.0001	**0.00**	0.16	<0.0001	0.16	<0.0001	**0.00**
Aspirin use (yes/no)	0.11	<0.0001	0.11	<0.0001	**0.00**	0.11	0.0002	0.11	0.0002	**0.00**
Menopause (yes/no)	0.01		0.11		**0.10**	0.06	0.140	0.06	0.140	**0.00**
One or both parents with type 2 diabetes (yes/no)	<0.01	0.881	<0.01	0.881	**0.00**	0.08	0.005	0.09	0.005	**0.01**
A1C										
DCCT eligibility	0.12	<0.0001	0.12	<0.001	**0.00**	0.03	0.242	0.03	0.242	**0.00**
Mean during DCCT	0.09	0.001	0.09	0.001	**0.00**	0.10	0.001	0.10	0.001	**0.00**
DCCT closeout	0.08	0.004	0.08	0.004	**0.00**	0.08	0.008	0.08	0.008	**0.00**
Mean during EDIC	0.09	0.003	0.09	0.001	**0.00**	0.04	0.115	0.04	0.115	**0.00**
At visit prior to CT	0.07	0.010	0.07	0.010	**0.00**	0.07	0.021	0.07	0.021	**0.00**
Mean during DCCT/EDIC	0.10	0.0003	0.10	0.0003	**0.00**	0.08	0.007	0.08	0.007	**0.00**

* Cleary PA, et.al *Diabetes* Vol. 55 [2006], Table 2, p. 3561.

Table 2, Continued. Partial Spearman rank correlation between CAC and covariates.

	Log CAC				
	Archived		Published*		Difference in coefficients
	Coeff	*P* value	Coeff	*P* value	
Attained age	0.34	<0.0001	0.34	<0.0001	**0.00**
Sex (male versus female)[f]	0.21	<0.0001	-0.21	<0.0001	**-0.42**
Smoking (yes/no)	0.14	<0.0001	0.14	<0.0001	**0.00**
DCCT baseline					
Retinopathy (yes/no)	0.12	<0.0001	0.12	<0.0001	**0.00**
Albumine excretion rate	0.09	0.001	0.09	0.001	**0.00**
Duration	0.12	<0.0001	0.12	<0.0001	**0.00**
Age	0.30	<0.0001	0.30	<0.0001	**0.00**
DCCT follow-up years	0.21	<0.0001	0.21	<0.0001	**0.00**
EDIC follow-up years	0.03	0.382	0.03	0.382	**0.00**
Most recent measure prior to CT scan					
Duration	0.17	<0.0001	0.17	<0.0001	**0.00**
Weight	0.01	0.747	0.001	0.747	**-0.01**
Height	-0.06	0.050	-0.06	0.050	**0.00**
BMI	0.04	0.214	0.04	0.214	**0.00**
Waist-to-hip ratio	0.14	<0.0001	0.14	<0.0001	**0.00**
Ankle-to-arm ratio	0.07	0.024	0.07	0.024	**0.00**
HDL	-0.10	0.001	-0.10	0.001	**0.00**
LDL	0.02	0.540	0.02	0.540	**0.00**
Total cholesterol	0.004	0.896	0.004	0.900	**0.00**
LDL-to-HDL ratio	0.07	0.011	0.07	0.011	**0.00**
Triglyceride	0.08	0.005	0.08	0.005	**0.00**
Hypercholesterolemia (yes/no)	0.14	<0.0001	0.14	<0.0001	**0.00**
Systolic blood pressure	0.07	0.020	0.07	0.020	**0.00**
Diastolic blood pressure	-0.02	0.401	-0.02	0.400	**0.00**
Hypertension (yes/no)	0.15	<0.0001	0.15	<0.0001	**0.00**
Albumin excretion rate >40 (yes/no)	0.11	0.0001	0.11	0.0001	**0.00**
Combined carotid IMT year 6	0.17	<0.0001	0.17	<0.0001	**0.00**
Aspirin use (yes/no)	0.13	<0.0001	0.13	<0.0001	**0.00**
Menopause (yes/no)	0.02	0.704	0.02	0.070	**0.00**
One or both parents with type 2 diabetes (yes/no)	0.01	0.785	0.01	0.785	**0.00**
A1C					
DCCT eligibility	0.12	<0.0001	0.12	<0.0001	**0.00**
Mean during DCCT	0.11	0.0002	0.11	0.0002	**0.00**
DCCT closeout	0.09	0.002	0.09	0.002	**0.00**
Mean during EDIC	0.09	0.001	0.09	0.001	**0.00**
At visit prior to CT	0.08	0.004	0.08	0.004	**0.00**
Mean during DCCT/EDIC	0.11	<0.0001	0.11	<0.0001	**0.00**

* Cleary PA, et.al *Diabetes* Vol. 55 [2006], Table 2, p. 3561.

[f] In Published analyses, the coding for sex was female vs. male, not male vs. female, thus reversing the direction of the Published correlation.

Reference.

[1] Cleary PA, Orchard TJ, Genuth S, Wong ND, Detrano R, Backlund JC, Zinman B, Jacobson A, Sun W, Lachin JM, and Nathan DM, for the DCCT/EDIC Research Group. **The Effect of Intensive Glycemic Treatment on Coronary Artery Calcification in Type 1 Diabetic Participants of the Diabetes Control and Complications Trial/Epidemiology of Diabetes Interventions and Complications (DCCT/EDIC) Study.** *Diabetes*, Vol 55 [Dec 2006], pp. 3556-65.

Attachment 1

Full Text of Article

Cleary PA, Orchard TJ, Genuth S, Wong ND, Detrano R, Backlund JC, Zinman B, Jacobson A, Sun W, Lachin JM, and Nathan DM, for the DCCT/EDIC Research Group.
The Effect of Intensive Glycemic Treatment on Coronary Artery Calcification in Type 1 Diabetic Participants of the Diabetes Control and Complications Trial/Epidemiology of Diabetes Interventions and Complications (DCCT/EDIC) Study.
Diabetes, Vol 55 [Dec 2006],
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Original Article

The Effect of Intensive Glycemic Treatment on Coronary Artery Calcification in Type 1 Diabetic Participants of the Diabetes Control and Complications Trial/Epidemiology of Diabetes Interventions and Complications (DCCT/EDIC) Study

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The Epidemiology of Diabetes Interventions and Complications (EDIC) study, an observational follow-up of the Diabetes Control and Complications Trial (DCCT) type 1 diabetes cohort, measured coronary artery calcification (CAC), an index of atherosclerosis, with computed tomography (CT) in 1,205 EDIC patients at ~7–9 years after the end of the DCCT. We examined the influence of the 6.5 years of prior conventional versus intensive diabetes treatment during the DCCT, as well as the effects of cardiovascular disease risk factors, on CAC. The prevalences of CAC >0 and >200 Agatston units were 31.0 and 8.5%, respectively. Compared with the conventional treatment group, the intensive group had significantly lower geometric mean CAC scores and a lower prevalence of CAC >0 in the primary retinopathy prevention cohort, but not in the secondary intervention cohort, and a lower prevalence of CAC >200 in the combined cohorts. Waist-to-hip ratio, smoking, hypertension, and hypercholesterolemia, before or at the time of CT, were significantly associated with CAC in univariate and multivariate analyses. CAC was associated with mean HbA_{1c} (A1C) levels before enrollment, during the DCCT, and during the EDIC study. Prior intensive diabetes treatment during the DCCT was associated with less atherosclerosis, largely because of reduced levels of A1C during the DCCT. *Diabetes* 55: 3556–3565, 2006

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Received for publication 11 May 2006 and accepted in revised form 23 August 2006.

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The Writing Group of the DCCT/EDIC Research Group takes responsibility for the contents of this article.

CAC, coronary artery calcification; CT, computed tomography; CVD, cardiovascular disease; DCCT, Diabetes Control and Complications Trial; EDIC, Epidemiology of Diabetes Interventions and Complications; IMT, intima-media thickness; ROC, receiver operating characteristics.

DOI: 10.2337/db06-0653

Patients with type 1 diabetes have a high risk of developing cardiovascular disease (CVD), which in young adulthood can be 10-fold higher than in the general population (1,2). The reasons for this increased risk have not been fully elucidated and can only be partly explained by standard cardiovascular risk factors. Surprisingly, cumulative hyperglycemia has not been shown consistently to be a risk factor for cardiovascular events in type 1 diabetes (3–8).

The Diabetes Control and Complications Trial (DCCT)/Epidemiology of Diabetes Interventions and Complications (EDIC) study provides an opportunity to explore the complex relationships among traditional CVD risk factors, glycemia, and CVD outcomes (9). The DCCT demonstrated the importance of glycemic control in preventing or delaying microvascular complications (10), but it did not reach a clear conclusion with respect to macrovascular complications, owing to the low prevalence of macrovascular disease in the relatively young cohort (11). The long-term EDIC follow-up included assessments of subclinical CVD with measurement of carotid intima-media thickness (IMT) (12,13) and with computerized tomography (CT) of the heart to detect and quantitate calcification in the coronary arteries, a marker of atherosclerosis (14). The EDIC study demonstrated a significant protective effect of prior intensive diabetes therapy, compared with conventional therapy, on the progression of IMT over a 6-year period that was associated with the level of HbA_{1c} (A1C) (13). Progression of IMT was associated with the level of glycemia (A1C) over time, consistent with some (15), but not all (16,17), reports in type 1 diabetes.

The association of glycemia with coronary artery calcification (CAC) in type 1 diabetes is unclear. Two studies (18,19) failed to demonstrate a relationship between glycemia and CAC in type 1 diabetes, whereas one did (20). These studies showed relationships with traditional CVD risk factors, but a smaller sex difference in CAC than is usual for the nondiabetic population, consistent with the reduction in the difference between sexes for CAD in type 1 diabetes.

The DCCT/EDIC study has recently reported (21) that

DCCT intensive therapy significantly reduced the long-term risk of clinical CVD by 42%; however, the cumulative incidence of such events remains low, precluding multivariate analyses at this time. Measurement of CAC provides an opportunity to assess the effects of putative and established CVD risk factors on the progression of atherosclerosis in type 1 diabetes that may ultimately translate into effects on risk of clinical events.

Herein we assess the long-term effects of original DCCT (conventional versus intensive) treatment assignment on the degree of CAC measured 8 years after the completion of the DCCT. We also examine the association of CAC with history of glycemia, with other risk factors and markers of CVD, and with clinically prevalent CVD.

RESEARCH DESIGN AND METHODS

Between 1983 and 1989, the DCCT enrolled 1,441 subjects with type 1 diabetes who, at baseline, were 13–39 years of age, had type 1 diabetes for 1–15 years, and were in generally good health (10). The DCCT consisted of two cohorts: the primary prevention cohort had type 1 diabetes for 1–5 years, no retinopathy, and urinary albumin excretion <40 mg per 24 h at baseline; the secondary intervention cohort had type 1 diabetes for 1–15 years, very mild to moderate nonproliferative retinopathy, and urinary albumin excretion ≤200 mg per 24 h at baseline. At the end of the DCCT in 1993, after 6.5 years of mean follow-up, intensive therapy was recommended for all subjects, and they returned to their own health care providers for diabetes care. In 1994, 1,375 (96%) of the 1,425 surviving members volunteered to participate in the EDIC observational follow-up study (9).

Computed tomography of coronary calcification. Computed tomography (CT) was performed between November 2000 and March 2003 (11–20 years after enrolment into the DCCT, 7–9 years after its end) in 1,205 (86%) of the surviving 1,404 participants, with specific patient consent. CT was performed in 19 scanning sites (see APPENDIX) using a C-150 cardiac-gated electron beam CT scanner ($n = 9$; Imatron, San Francisco, CA), a Lightspeed ($n = 7$; General Electric Medical Systems, Waukesha, WI) or a Volume Zoom (Siemens, Erlanger, Germany) multidetector CT system, a Lightspeed Marconi MX-8000 (GE), or a Somatom 4+ (Siemens) ($n = 3$). All participants were scanned twice over calibration phantoms of known physical calcium concentration.

Scans were read centrally at the Harbor-UCLA (University of California, Los Angeles) Research and Education Institute (Torrance, CA) to identify and quantify CAC, calibrated according to the readings of the phantom using the method of Agatston et al. (22). The average score from the two scans was used in the analysis. Readers were masked to subject identity and prior treatment assignment.

Scans were evaluated by the staff at the reading center on seven criteria: motion artifact, streak artifact, phantom placement, slice registration, lack of noise, axis coverage, and *xy* axis coverage. The 19 scanning centers were monitored monthly on these criteria. The intra- and interreader precision was evaluated with the use of a set of standard scans that were reread by the same reader and another reader at the reading center. The kappa measure of intrareader agreement beyond chance for the presence or absence of calcification was 0.81, and the interreader kappa was 0.86. The coefficient of reliability for the calcification scores was 0.99 for both inter- and intrareader.

Other procedures. Each EDIC subject had an annual history, physical examination, electrocardiogram, and laboratory testing, including serum creatinine and A1C, determined as they were during the DCCT (9,10,23). Fasting lipid profiles and 4-h urine collections for measurement of albumin excretion rate and creatinine clearance were obtained in alternate years during the EDIC study (9). Carotid IMT was measured by B-mode ultrasonography in 1994 and again in 2000–2001 (12,13). Combined IMT was defined as the sum of the standardized intima-media measurements of the common and internal carotid arteries. Standardized IMT was defined as: (variable − mean) ÷ SD, as described by O'Leary et al. (24).

Hypertension was defined as systolic blood pressure ≥140 mmHg or diastolic blood pressure ≥90 mmHg, documented hypertension, or use of antihypertensive agents. Hypercholesterolemia was defined as LDL cholesterol ≥130 mg/dl or use of lipid-lowering agents. Cardiovascular clinical outcomes included fatal and nonfatal myocardial infarctions, stroke, revascularization (bypass surgery or angioplasty), angina confirmed with a positive exercise tolerance test or angiogram, or silent myocardial infarctions identified using criteria applied to the follow-up electrocardiogram. For classification of cardiovascular clinical outcomes, information from death certificates; medical records from hospitalizations; autopsy reports, if available; and interviews with the participants were reviewed by the EDIC mortality and morbidity committee, masked to treatment assignment, and the event was classified according to specified guidelines (25).

Statistical analyses. Analyses were conducted using SAS (26). Clinical characteristics were compared using Wilcoxon's rank-sum test for continuous quantitative variables and χ^2 or Fisher's exact tests for categorical variables. Analyses used the prevalence of CAC scores of >0 and >200 Agatston units; the latter has been a predictor of CVD events in other studies (18,20,27). The Mantel-Haenszel χ^2 test of nonzero correlation was used to test for a linear trend in proportions (28). The stratified adjusted Mantel-Haenszel analysis adjusted for other qualitative covariate effects on the OR or test of trend (28). Homogeneity of treatment effect over strata was assessed by the Breslow-Day test (28). Logistic regression examined the relationship between covariates and the prevalence of CAC (28,29). The entropy R^2 coefficient was used to describe the proportion of variation in risk explained by the model (29).

Tobit-censored regression models (30) assessed covariate effects on the observed CAC score, which is a mixture of a discrete random variable (any measurable calcification, yes/no) and a quantitative random variable (the amount of CAC, if measurable). The Tobit regression coefficient represents the log ratio of the geometric mean CAC score per unit increase in the covariate, assuming some true measurable calcification for all subjects, including those with undetectable levels. Ordinary multiple regression of the observed measurable values is biased, whereas logistic regression of the prevalence of measurable calcification is inefficient (31). The Tobit model was fit using the LIFEREG procedure in SAS (26), where the natural logarithm of the nonzero CAC scores was reduced by subtracting the natural logarithm of the lowest detectable CAC score (the lower limit of quantification of CAC). Goodness of fit was assessed by applying the Hosmer-Lemeshow test to the estimated probabilities from the Tobit model as a predictor for presence of CAC, and by the Spearman correlation coefficient between the measured score of CAC and that predicted from the Tobit model (32).

The intent-to-treat effects of prior DCCT conventional versus intensive therapy were assessed in basic logistic and Tobit models, adjusted for baseline age, type 1 duration, sex, scanning site, and DCCT baseline retinopathy cohort (primary versus secondary). Additional multivariate models explored effects of covariates measured up to the time of CAC measurement. The most significant factor among similar variables (e.g., systolic and diastolic blood pressure) was used. Backward elimination was used to select two-way interactions with treatment group (28,29), retaining those nominally significant at $P \leq 0.05$. In models with an interaction, the overall treatment effect was assessed using a test of both the group and the group by covariate interaction on 2 degrees of freedom (df) (29). Receiver operating characteristics (ROC) plots were used to describe the sensitivity and specificity of CAC for prevalent CVD (21,33–35).

RESULTS

Clinical characteristics. Table 1 shows the clinical characteristics of the participants in the CT study at DCCT baseline and at the exam immediately before, or at time of, the CT scan, stratified by sex and original DCCT treatment group. Of the 1,205 participants, 95% were Caucasian, and 53% were male. In both male and female subjects, blood pressure and lipids were not significantly different between the former DCCT conventional- and intensive-treatment groups at the time of the CT scans. In men only, prevalence of hypertension and aspirin use were significantly lower in the intensive group. The A1C level before CT was similar in the treatment groups in both sexes, but mean A1C level during the ~9 years of EDIC follow-up before the CT scan was slightly higher in the conventional than in the intensive group in men (8.2 vs. 8.0 ± 1.1%, $P < 0.01$). Albumin excretion rates were significantly lower in the intensive than in the conventional-treatment group ($P < 0.01$). Measurements of adiposity were not different between the treatment groups. A comparison of the EDIC subjects who participated in the CT study with those who did not participate revealed similar distributions of sex, race, and treatment group. However, the participants who did not have CT scans were younger (25 vs. 27 years at DCCT entry) and had higher mean A1C (8.5 vs. 8.2%, $P < 0.003$) during the DCCT.

TABLE 1
Clinical characteristics of participants in CT scan study by sex and DCCT treatment assignment

	Female subjects		Male subjects	
	Intensive	Conventional	Intensive	Conventional
n	297	275	300	333
Age at entry into DCCT (years)	27 ± 7*	26 ± 7	28 ± 7	28 ± 7
DCCT follow-up (years)	6.4 ± 1.7	6.3 ± 1.7	6.4 ± 1.7	6.1 ± 1.6
EDIC follow-up (years)	9.2 ± 0.5	9.1 ± 0.5	9.1 ± 0.5	9.2 ± 0.5
DCCT baseline				
Retinopathy (negative by fundus photographs) (%)	51	49	46	54
Albumin excretion rate (mg/24 h)	16 ± 20	15 ± 13	17 ± 21	15 ± 20
Diabetes duration (months)	69 ± 50	71 ± 51	70 ± 50†	60 ± 46
Visit prior to or at time of CT scan				
Age (years)	43 ± 7*	42 ± 7	43 ± 7	43 ± 7
Current smokers (%)	15	14	18	15
Diabetes Duration (years)	21 ± 5	21 ± 5	21 ± 5π	20 ± 5
BMI (kg/m^2)	28 ± 5	27 ± 5	28 ± 4	28 ± 4
Natural waist-to-hip ratio	0.79 ± 0.07	0.78 ± 0.06	0.91 ± 0.06	0.90 ± 0.06
Ankle-to-arm blood pressure ratio <0.9 (%)	15	12	7	8
Systolic BP (mmHg)	120 ± 14	120 ± 15	123 ± 13	125 ± 15
Diastolic BP (mmHg)	75 ± 9	74 ± 9	78 ± 9	78 ± 10
Hypertensive (%)§	29	36	35¶	46
Aspirin ≥14 tablets per month (%)	22	25	26§	33
Menopause (%)	26	21	—	—
One or both parents with diabetes (%)	20	15	17	19
Carotid IMT year 6	0.60 ± 0.11	0.59 ± 0.10	0.63 ± 0.10	0.65 ± 0.14
Lipids				
Total cholesterol (mmol/l)	4.94 ± 0.95	4.83 ± 0.84	4.81 ± 0.90	4.73 ± 0.85
HDL cholesterol (mmol/l)	1.59 ± 0.38	1.62 ± 0.38	1.31 ± 0.35	1.32 ± 0.30
LDL cholesterol (mmol/l)	2.89 ± 0.76	2.81 ± 0.69	2.98 ± 0.76	2.92 ± 0.74
LDL-to-HDL ratio	1.9 ± 0.8	1.8 ± 0.6	2.4 ± 0.9	2.3 ± 0.8
Triglycerides (mmol/l)	0.95 ± 0.64	0.89 ± 0.58	1.15 ± 0.88	1.06 ± 0.61
Hypercholesterolemia (%)‡	30	29	44	40
Renal				
Albumin excretion rate (mg/24 h)	36 ± 194†	84 ± 370	105 ± 731†	234 ± 863
Albumin excretion rate >40 mg/24 h (%)	9‖	18	13‖	26
A1C				
At DCCT eligibility	9.2 ± 1.6	9.1 ± 1.7	9.0 ± 1.6	8.8 ± 1.6
Mean during DCCT	7.3 ± 0.9‖	9.1 ± 1.4	7.2 ± 0.9‖	8.9 ± 1.1
At DCCT closeout	7.3 ± 1.0‖	9.1 ± 1.8	7.4 ± 1.1‖	9.1 ± 1.3
Mean during EDIC	8.1 ± 1.2	8.1 ± 1.2	8.0 ± 1.1†	8.2 ± 1.1
Mean at visit prior to CT	8.0 ± 1.4	7.9 ± 1.5	7.9 ± 1.2	7.9 ± 1.3
Mean during combined DCCT/EDIC	7.8 ± 0.9‖	8.5 ± 1.1	7.7 ± 1.0‖	8.5 ± 1.0

Data are the means ± SD unless otherwise indicated. *$P < 0.05$, †$P < 0.01$, and ‖$P < 0.001$ for intensive vs. conventional. ‡LDL ≥130 or using anti-lipid agents; §defined as systolic ≥140 or diastolic ≥90 mmHg, or hypertension has been documented, or using antihypertensive agents.

CAC distributions. Figure 1 shows the distribution of CAC scores, including the prevalence of CAC = 0, 1–200, and >200 Agatston units by treatment group stratified by primary prevention and secondary intervention cohorts. These analyses showed differences between treatment groups in the primary cohort ($P = 0.03$), but not in the secondary cohort ($P = 0.41$), not adjusted for scanning site or other baseline factors.

Figure 2*A–D* shows the prevalences of CAC >0 and >200 Agatston units within each treatment group, stratified by sex and also by decade of age at the time of the scan. The overall prevalences for CAC >0 and >200 Agatston units were 31.0 and 8.5%, respectively. The prevalences of CAC >0 and >200 Agatston units increased linearly by decade of age within each sex ($P < 0.01$ for each). Within both sexes, and within each treatment group, the prevalence of calcification increased significantly with age, except for CAC >200 Agatston units in the intensive group among women, for which the overall incidence was lower than for men or conventional group women, especially among those ≥50 years.

DCCT treatment group differences. In the primary cohort, compared with the conventional-treatment group, the intensive-treatment group had a significantly lower prevalence of CAC >0 Agatston units (21.7 vs. 29.8%, respectively), with an adjusted odds ratio (OR) for conventional versus intensive therapy of 1.59 (95% CI 1.06–2.39, $P = 0.024$). By contrast, there was no treatment effect in the secondary cohort (OR 0.94). The difference in ORs between cohorts (i.e., group by cohort interaction) was barely significant ($P = 0.049$).

The adjusted effect of conventional versus intensive therapy on the prevalence of CAC >200 Agatston units within the primary prevention cohort (OR 2.13) was not significantly different from that in the secondary intervention cohort (1.50, $P = 0.474$ for test of interaction). For the two cohorts combined, the adjusted treatment group effect had an OR of 1.65 (95% CI 1.06–2.58, $P = 0.026$).

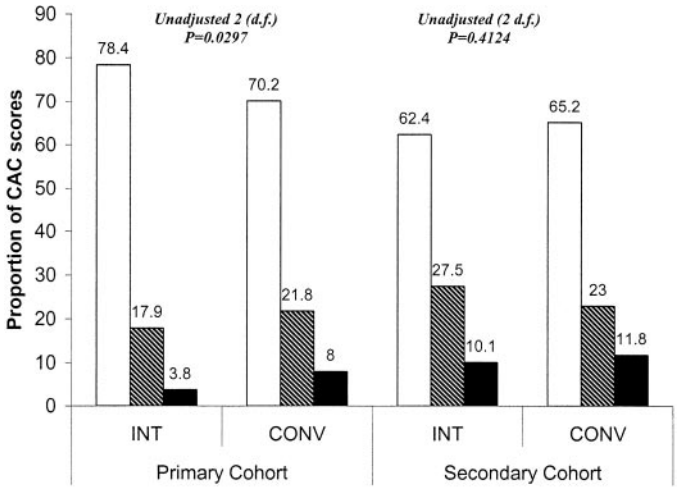

FIG. 1. Distribution of CAC scores (Agatston units) by cohort and treatment group. □, CAC = 0; ▨, CAC 1–200; ■, CAC >200. CONV, conventional treatment; INT, intensive treatment.

In a Tobit regression analysis of the log(CAC) score in the primary prevention cohort, allowing for nonmeasurable values, the conventional-treatment group on average had a 3.7-fold higher CAC score than the intensive group (95% CI 1.3–10.5, $P = 0.014$). However, there was no treatment group difference within the secondary intervention cohort, the geometric mean ratio being 1.00 (0.4–2.5, $P = 0.87$). The difference between the primary versus secondary cohorts (i.e., the 3.7 vs. 1.0 treatment group effect) approached statistical significance ($P = 0.060$ for the test of interaction). Further analyses in the secondary intervention cohort revealed a significant group by diabetes duration interaction effect ($P = 0.0008$) and the overall treatment group effect with 2 df was significant ($P = 0.003$). The treatment effect increased with longer duration of diabetes at DCCT baseline, with the geometric mean ratio 1.4-fold higher for each additional year of diabetes duration (Fig. 3). This interaction was diminished after adjusting for A1C at DCCT entry, smoking, hypertension, and waist-to-hip ratio at the time of CT scan, but it remained significant ($P = 0.0097$).

A further analysis adjusting for the differences in the log mean A1C between treatment groups during the DCCT explained virtually all of the treatment group effect within the primary prevention cohort. For the Tobit model, the treatment group effect ($P = 0.01$) became nonsignificant ($P = 0.69$) after adjustment for A1C. In the Tobit model within the primary prevention cohort, and with the above baseline factors, a 10% increase in the DCCT mean A1C was associated with a 1.85-fold increase in the geometric mean CAC score ($P < 0.0001$); within the secondary intervention cohort, it was associated with a 1.32-fold increase ($P = 0.051$). The difference between cohorts (test of interaction) was not significant ($P = 0.21$).

Correlation between CAC and CAD risk factors. Univariate rank correlations, partially adjusted for DCCT baseline age and sex, assessed the association between the prevalence of CAC >0 Agatston units, CAC >200 Agatston units, and the log CAC, with covariates (Table 2). The results were similar across all of the CAC outcomes. Attained age ($r = 0.34$), male sex ($r = 0.21$), waist-to-hip ratio ($r = 0.14$), combined common and internal carotid IMT at year 6 ($r = 0.17$), hypercholesterolemia ($r = 0.14$),

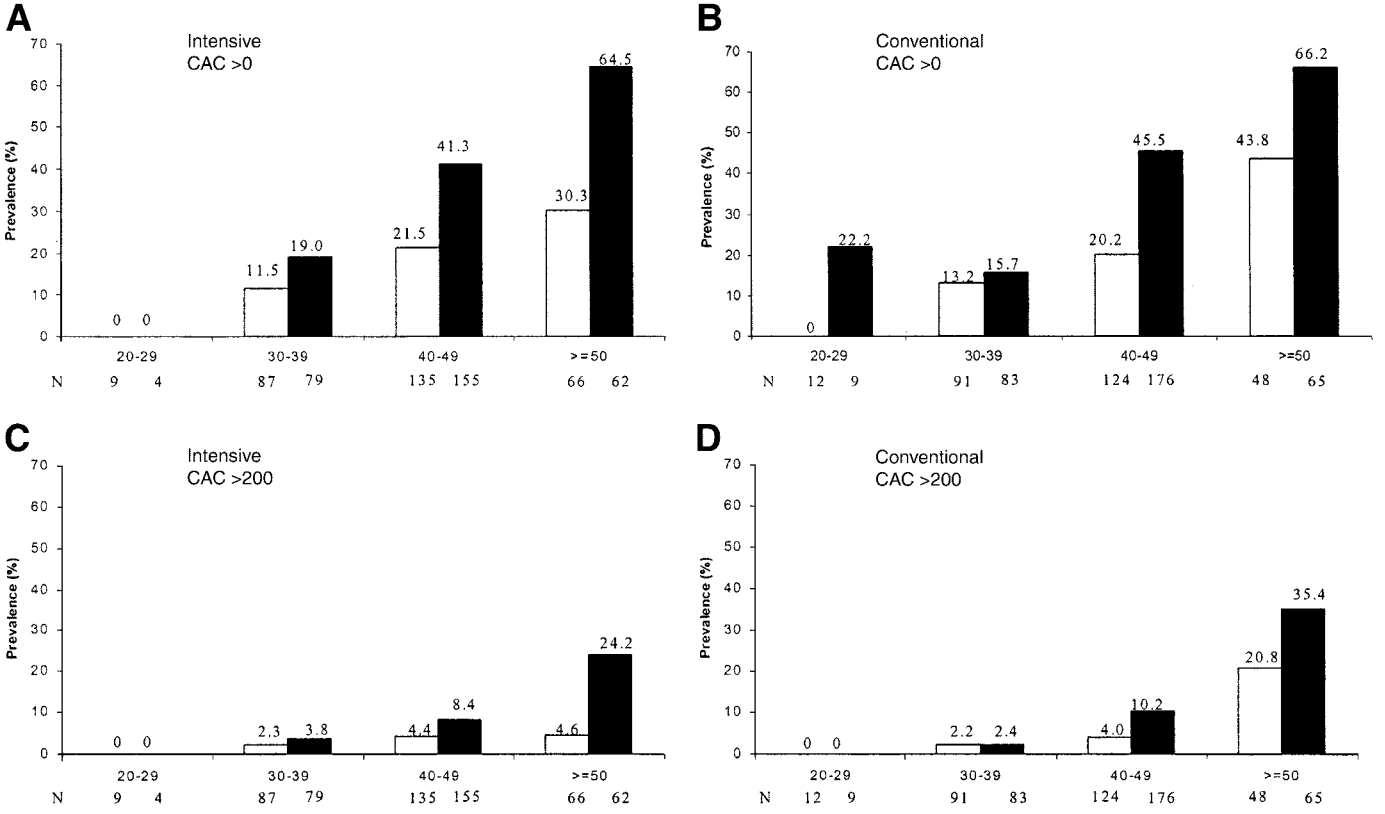

FIG. 2. Unadjusted prevalence of CAC >0 and CAC >200 Agatston units within each treatment group, separately stratified by sex and age at the time of the scan. *A*: CAC >0 intensive treatment. *B*: CAC >0 conventional treatment. *C*: CAC >200 intensive treatment. *D*: CAC >200 conventional treatment. The number of subjects evaluated in each age category is noted. □, female subjects; ■, male subjects.

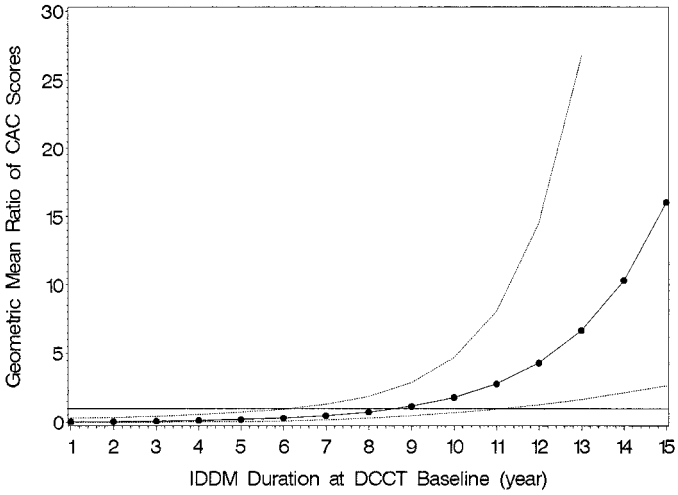

FIG. 3. Estimated geometric mean ratio of CAC scores for conventional- versus intensive-treatment groups as a function of type 1 duration, using the Tobit model, at DCCT baseline in the secondary cohort. Dotted lines represent 95% CIs. The overall treatment group difference was significant ($P = 0.003$). Overall age effect was also significant ($P < 0.0001$). P values for durations of 1–15 years, respectively, are 0.002, 0.003, 0.004, 0.007, 0.015, 0.043, 0.154, 0.535, 0.756, 0.235, 0.061, 0.019, 0.008, 0.004, and 0.002. P values are a test that the ratio = 1 at each year of duration. IDDM, type 1 diabetes.

and hypertension ($r = 0.15$) had the strongest association with the log CAC. There was no significant correlation with ankle-to-arm blood pressure ratio. Other weaker or less consistent correlates were with smoking, DCCT baseline retinopathy status, microalbuminuria, menopausal status, and a parental history of type 2 diabetes. Neither total cholesterol nor LDL cholesterol levels were significant correlates, whereas triglyceride level was positively and HDL cholesterol level was negatively correlated with CAC. A1C before the DCCT, the mean levels during the DCCT, at DCCT closeout, before the CAC scan, mean during EDIC, and mean during DCCT and EDIC all correlated with CAC ($P < 0.01$).

Multivariate regression models. Expanded multivariate regression models assessed the association of additional risk factors, measured either at DCCT baseline or close to the time of the CT scan during EDIC, with CAC. In a logistic model, hypercholesterolemia, increased waist-to-hip ratio, and smoking were significantly associated with prevalence of CAC >0 Agatston units. As observed in the intent-to-treat analysis of the DCCT treatment group effect, there was a significant interaction between treatment group and baseline retinopathy strata (primary versus secondary cohort). Overall, the model explained 20% (R^2) of the variation in risk. A logistic regression model with the prevalence of CAC >200 Agatston units produced similar results.

The multivariate Tobit regression model (Table 3) provided results similar to the two logistic regression models. The CAC score increased 1.3-fold per year of age, was 3.4-fold more for men than women, was 7.1-fold greater among current smokers, and increased 1.3-fold per 10 mg per 24 increase in albumin excretion rate, 2.6-fold per 10% increase in waist-to-hip ratio, 2.8-fold among those with hypercholesterolemia, 2.8-fold among those with hypertension, and 1.4-fold per 10% increase in DCCT mean A1C. The Hosmer-Lemeshow test ($P = 0.14$), comparing the Tobit model predicted probability of having CAC to the detected presence of CAC, and the significant Spearman correlation coefficient (0.4781, $P < 0.0001$) between the predicted and observed CAC scores both suggest that this model fits the observed data.

Sensitivity and specificity. The sensitivities and specificities of CAC >0 and >200 Agatston units for nonfatal myocardial infarction ($n = 10$) were 80 and 69.4% and 70 and 92.1%, respectively. The sensitivities and specificities for all CVD events (see RESEARCH DESIGN AND METHODS, $n = 44$) for CAC >0 and >200 Agatston units were 72.7 and 70.5% and 47.7 and 93.0%, respectively. The ROC curve (Fig. 4) reflects the characteristics of the CAC score with discriminating power for CVD. CAC >0 Agatston units showed the highest (29%) false-positive rate and highest (73%) true-positive rate. The false- and true-positive rates for CAC >200 Agatston units were 7 and 44%, respectively. The area under the ROC curve was 0.78 (95% CI 0.69–0.86).

DISCUSSION

The most important and new observation of this study is that the prevalence of CAC, and the CAC scores, in the DCCT/EDIC type 1 diabetes cohort are significantly lower in the former intensive treatment compared with the former conventional-treatment group. The prevalence of a clinically significant CAC score of >200 Agatston units was 7.0% in the former intensive-treatment group and 9.9% in the former conventional-treatment group.

The beneficial effect of prior intensive therapy during the 6.5 years of the DCCT was greater among those entered into the primary prevention cohort with 1–5 years' diabetes duration on entry, among other factors, than among those entered into the secondary intervention cohort with 1–15 years' duration. The beneficial effect of intensive therapy is largely attributable to the differences between groups in the level of A1C during the DCCT.

The lesser treatment effect in the secondary intervention cohort appeared to be the result of an interaction between baseline diabetes duration and treatment group (Fig. 3). The beneficial treatment effect at longer durations was washed out by the negative treatment effect at shorter durations, mainly 1–5 years. The absence of a treatment effect among those in the secondary intervention cohort with only 1–5 years' duration could be an artifact of the selection criteria. Prior epidemiological modeling (36) suggests that subjects who have retinopathy present after only 1–5 years' duration tend to have higher preexisting levels of A1C that could in turn diminish the long-term effectiveness of intensive therapy on other outcomes, such as CAC. In addition, there were some imbalances between treatment groups in the subcohort of the secondary intervention cohort with 1–5 years' diabetes duration. Most importantly, compared with the conventional-treatment patients, intensive-treatment patients had higher A1C levels at DCCT entry (9.6 vs. 8.8%).

The 31% prevalence of CAC >0 Agatston units in the DCCT/EDIC cohort is lower than in other reports of type 1 diabetic cohorts (18–20,37). This may reflect a substantially lower CVD risk, based on eligibility criteria and lower mean A1C, than in other studies. In addition, unlike some (18–20) but not all (37) reports, female subjects in the DCCT/EDIC study had a lower prevalence of CAC level in all age-groups. The male-to-female OR of 2.7 for CAC >0 Agatston units in our cohort is similar to the OR of 2.5 reported in a previous study of type 1 diabetes (37).

Most previous studies in type 1 diabetes have not shown

TABLE 2
Partial Spearman rank correlation between CAC and covariates*

	CAC >0		CAC >200		Log CAC†	
	Coefficient	*P* value	Coefficient	*P* value	Coefficient	*P* value
Attained age	0.32	<0.0001	0.25	<0.0001	0.34	<0.0001
Sex (male versus female)‡	0.21	<0.0001	0.11	<0.0001	−0.21	<0.0001
Smoking (yes/no)	0.13	<0.0001	0.12	<0.0001	0.14	<0.0001
DCCT baseline						
Retinopathy (yes/no)	0.11	0.0001	0.09	0.003	0.12	<0.0001
Albumin excretion rate	0.09	0.003	0.07	0.012	0.09	0.001
Duration	0.11	0.0002	0.08	0.007	0.12	<0.0001
Age§	0.28	<0.0001	0.22	<0.0001	0.30	<0.0001
DCCT follow-up years	0.19	<0.0001	0.14	<0.0001	0.21	<0.0001
EDIC follow-up years	0.01	0.693	0.03	0.282	0.03	0.382
Most recent measure prior to CT scan						
Duration	0.16	<0.0001	0.13	<0.0001	0.17	<0.0001
Weight	0.02	0.512	−0.02	0.424	0.001	0.747
Height	−0.04	0.185	−0.08	0.005	-0.06	0.050
BMI	0.03	0.235	0.02	0.518	0.04	0.214
Waist-to-hip ratio	0.14	<0.0001	0.08	0.006	0.14	<0.0001
Ankle-to-arm ratio	−0.04	0.125	−0.09	0.002	0.07	0.024
HDL	−0.10	0.001	−0.06	0.056	-0.10	0.001
LDL	0.02	0.535	0.01	0.791	0.02	0.540
Total cholesterol	<0.01	0.981	0.01	0.627	0.004	0.900
LDL-to-HDL ratio	0.08	0.007	0.03	0.307	0.07	0.011
Triglyceride	0.07	0.015	0.07	0.012	0.08	0.005
Hypercholesterolemia (yes/no)	0.13	<0.0001	0.11	<0.0001	0.14	<0.0001
Systolic blood pressure	0.06	0.040	0.07	0.020	0.07	0.020
Diastolic blood pressure	−0.03	0.291	0.02	0.500	-0.02	0.400
Hypertension (yes/no)	0.12	<0.0001	0.12	<0.0001	0.15	<0.0001
Albumin excretion rate >40 (yes/no)	0.09	0.003	0.12	<0.0001	0.11	0.0001
Combined carotid IMT year 6	0.16	<0.0001	0.16	<0.0001	0.17	<0.0001
Aspirin use (yes/no)	0.11	<0.0001	0.11	0.0002	0.13	<0.0001
Menopause (yes/no)	0.11		0.06	0.140	0.02	0.070
One or both parents with type 2 diabetes (yes/no)	<0.01	0.881	0.09	0.005	0.01	0.785
A1C						
DCCT eligibility	0.12	<0.001	0.03	0.242	0.12	<0.0001
Mean during DCCT	0.09	0.001	0.10	0.001	0.11	0.0002
DCCT closeout	0.08	0.004	0.08	0.008	0.09	0.002
Mean during EDIC	0.09	0.001	0.04	0.155	0.09	0.001
At visit prior to CT	0.07	0.010	0.07	0.021	0.08	0.004
Mean during DCCT/EDIC	0.10	0.0003	0.08	0.007	0.11	<0.0001

*Adjusted for DCCT baseline age and sex; †log CAC = 0 if CAC = 0; log CAC = log (CAC) − log (0.92) if CAC >0; ‡adjusted for baseline age only; §adjusted for sex only.

a significant association between glycemic control and CVD or CAD events, either cross-sectionally (3–5) or prospectively (6). Moreover, two previous studies have not shown a relationship between glycemic control and CAC (18,19). However, a recent report (20) showed a greater risk of progression of CAC over 3 years among those with A1C >7.5% than patients with A1C <7.5%. Perhaps owing to the small numbers who progressed (21 of 109), A1C was not a significant univariate risk factor. In contrast, the DCCT/EDIC study, with a much larger sample size and detailed longitudinal assessment of metabolic control, has shown that A1C measured before DCCT enrollment, mean A1C during the DCCT (which had the strongest correlation), and mean level during the EDIC study were each significantly correlated with CAC after adjustment for age and sex, and were independent of waist-to-hip ratio, smoking, hypertension, and hypercholesterolemia before CT scan. The DCCT cohort was selected to exclude patients with hypertension and hypercholesterolemia on entry to the DCCT, and the impact of hyperglycemia may have become more apparent without the influence of these conventional CVD risk factors at baseline.

In univariate analyses, most of the known risk factors for coronary artery disease, including age, smoking, systolic blood pressure, hypertension, waist-to-hip ratio, hypercholesterolemia, HDL cholesterol and triglyceride levels, and microalbuminuria, were significantly associated with the presence of CAC in the DCCT/EDIC study. Although both microalbuminuria and hypertension were also reduced by prior intensive treatment (38), the effect of glycemic control on coronary artery calcium control was independent of these two risk factors. The LDL cholesterol level was not by itself a significant continuous risk factor for the prevalence of coronary artery calcium in the DCCT/EDIC study.

In the Tobit multivariate regression model, the mean CAC score was significantly greater in older individuals, men, and those with higher waist-to-hip ratios, retinopathy at DCCT baseline, and higher albumin excretion rates. The association of early signs of microvascular complications

TABLE 3
Risk factor analysis for CAC

Covariates	Geometric mean ratio of CAC scores (95% CI)*	χ^2	*P* value
Sex (male versus female)	3.4 (1.4–8.3)	6.8	0.0091
Scanning site (n = 19)	—	28.1	0.0611
DCCT baseline			
Age (year)	1.3 (1.2–1.4)	81.7	<0.0001
Diabetes duration (year)	1.3 (1.1–1.6)	4.1	0.0441
Albumin excretion rate (mg/24 h)†	1.3 (1.1–1.5)	7.3	0.0069
Cohort (primary versus secondary)	1.7 (0.7–4.4)	1.2	0.2651
EDIC year 7–9 (prior to CT scan)			
Smoking (yes versus no)	7.1 (3.0–16.9)	19.7	<0.0001
Waist-to-hip ratio (%)†	2.6 (1.5–4.5)	11.5	0.0007
Hypercholesterolemia (yes versus no)	2.8 (1.4–5.7)	8.6	0.0033
Hypertension (yes versus no)	2.8 (1.4–5.7)	8.6	0.0034
DCCT mean A1C†	1.4 (1.1–1.7)	9.3	0.0022

Analysis was performed using Tobit regression: Y = log CT − log (lowest detectable CT score). *Geometric mean ratio of CAC scores is the ratio of predicted CAC scores for a 1-unit increase in quantitative variables or change in status for dichotomous variables if without notation; †geometric mean ratio of CAC scores is based on 10 mg/24 h increase in albumin excretion rate, 10% increase in waist-to-hip ratio, and 10% increase in DCCT mean A1C.

with later CAC may reflect some common elements in their development and in the pathogenesis of atherosclerosis, such as hypertension or hyperglycemia.

We previously reported that the rate of progression of carotid artery IMT from DCCT closeout to 6 years later was reduced by prior intensive treatment (13). This effect was largely explained by the difference in A1C levels that existed between the two prior treatment groups. We have now shown that CAC correlates significantly with carotid IMT that was measured 1–3 years earlier (Table 2). Taken together, these prolonged effects of intensive treatment on both coronary artery calcium and carotid IMT support the interpretation that lowering glycemia with intensive treatment results in a slowing of atherosclerosis.

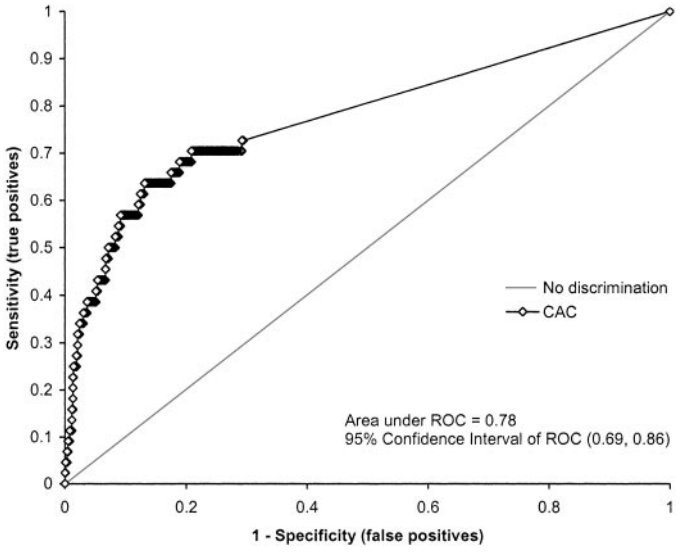

FIG. 4. ROC curve of CAC relative to cardiovascular events. True-positives are plotted on the *y*-axis and false-positives on the *x*-axis. The accuracy of the CAC is the area under the curve. An area of 1 represents a perfect test; an area of 0.5 represents a worthless test. An area under the curve of 0.78 implies that there is a 78% likelihood that a randomly selected affected case subject will have a higher CAC score than a randomly selected nonaffected control subject. The 95% CI (0.69–0.86) indicates that the lower end point is >0.50 and is better than random chance.

The mechanism(s) by which hyperglycemia causes atherosclerosis is incompletely understood but could involve long-lived advanced glycation end products (39,40) in vessel walls and their interactions with advanced glycation end product receptors (41). The demonstration of a delayed benefit from intensive treatment on atherosclerosis is also consistent with the persistent beneficial effect of prior intensive treatment on retinopathy and nephropathy during the EDIC study (38,42). The observation of a treatment effect principally within the primary prevention cohort with a preexisting mean duration of diabetes of 2.5 years on entry adds further weight to the recommendation that intensive treatment be started as early in the course of type 1 diabetes as safely and practically possible.

Certain limitations of this study should be noted. A baseline assessment of CAC was not obtained either at the beginning of the DCCT or at the beginning of EDIC study. Although such assessments are not necessary to document a treatment effect on CAC levels, without baseline levels it is not possible to describe the magnitude or rate of change in CAC over time. Theoretically, it is possible that these findings simply reflect a chance baseline imbalance in the CAC levels. However, this appears unlikely given the similarity of characteristics relevant to atherosclerosis in the conventional-treatment and intensive-treatment groups at DCCT baseline (9,10). Although CAC scores measured by electron-beam CT and multidetector CT correlate very well (43), the use of several different machines to measure CAC may have added variability to the measurements and interfered with our ability to establish correlations. However, even if we looked separately at the results from the nine electron-beam CT scanners and the results from the other scanners, the trend in differences between intensive- and conventional-treatment groups remained (data not shown).

The overwhelming majority of the subjects did not have any detectable levels of calcification, thus reducing the sensitivity of these analyses to detect an effect of intensive therapy, or to assess the relative effects of glycemia and known risk factors. The low prevalence of measurable CAC also limits the ability to assess the predictive value of CAC for future macrovascular events. Nevertheless, significant risk factor effects were observed, and an ROC analysis showed significant association between CAC score and prevalence of overt CVD at the time of assessment. A recent DCCT/EDIC analysis showed that intensive therapy reduced the risk of aggregate CVD events by 42% and the risk of major clinical events (fatal or nonfatal myocardial infarction or stroke) by 57% (each $P < 0.02$) (21). However, the predictive value of a given level of CAC for the risk of a future CVD event cannot be definitively assessed, owing to the small number of such events that were observed after the measurement of CAC.

Finally, although coronary artery calcium is a quantitative marker of coronary atherosclerosis burden (44,45) and predicts coronary artery disease measured by angiography (46,47), it is not known whether the reduction in the

prevalence of CAC with intensive therapy will translate into a reduction in the incidence of coronary artery disease and other CVD events (48,49). The usefulness of screening asymptomatic patients with CT is controversial (50,51). The majority of DCCT/EDIC participants with a mean age of 43 years at the time of CAC measurement displayed no detectable coronary artery calcium. Further follow-up with assessment of clinical events will permit us to assess the predictive power of CAC for incident CVD events.

ACKNOWLEDGMENTS

Supported by contracts with the Division of Diabetes, Endocrinology and Metabolic Disease of the National Institute of Diabetes and Digestive and Kidney Diseases and by the General Clinical Research Center Program, National Center for Research Resources, National Institutes of Health.

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Editor, EDIC Publications: D. Nathan.

REFERENCES

1. Krolewski AS, Kosinski EJ, Warram JH, Leland OS, Busick EJ, Asmal AC et al: Magnitude and determinants of coronary artery disease in juvenile-onset, insulin-dependent diabetes mellitus. *Am J Cardiol* 59:750–755, 1987
2. Dorman JS, Laporte RE, Kuller LH, Cruickshanks KJ, Orchard TJ, Wagener DK, Becker DJ, Cavender DE, Drash AL: The Pittsburgh insulin-dependent diabetes mellitus (IDDM) morbidity and mortality study: mortality results. *Diabetes* 33:271–276, 1984
3. Orchard TJ, Olson JC, Erbey JR, Williams K, Forrest KY, Smithline Kinder L, Ellis D, Becker DJ: Insulin resistance-related factors, but not glycemia, predict coronary artery disease in type 1 diabetes: 10-year follow-up data from the Pittsburgh Epidemiology of Diabetes Complications Study. *Diabetes Care* 26:1374–1379, 2003
4. Forrest KY, Becker DJ, Kuller LH, Wolfson SK, Orchard TJ: Are predictors of coronary heart disease and lower-extremity arterial disease in type 1 diabetes the same? A prospective study. *Atherosclerosis* 148:159–169, 2000
5. Koivisto VA, Stevens LK, Mattock M, Ebeling P, Muggeo M, Stephenson J, Idzior-Walus B: Cardiovascular disease and its risk factors in IDDM in Europe: EURODIAB IDDM Complications Study Group. *Diabetes Care* 19:689–697, 1996
6. Fuller JH, Stevens LK, Wang SL: Risk factors for cardiovascular mortality and morbidity: the WHO multinational study of vascular disease in diabetes. *Diabetologia* 44 (Suppl. 2):S54–S64, 2001
7. Lehto S, Rönnemaa T, Pyörälä K, Laakso M: Poor glycemic control predicts coronary heart disease events in patients with type 1 diabetes without nephropathy. *Arterioscler Thromb Vasc Biol* 19:1014–1019, 1999
8. Moss SE, Klein R, Klein BE, Meuer SM: The association of glycemia and cause-specific mortality in a diabetic population. *Arch Int Med* 154:2473–2479, 1994
9. Epidemiology of Diabetes Interventions and Complications (EDIC) Research Group: Epidemiology of Diabetes Interventions and Complications (EDIC): design, implementation, preliminary results of a long-term follow-up of the Diabetes Control and Complications Trial cohort. *Diabetes Care* 22:99–111, 1999
10. Diabetes Control and Complications Trial Research Group: The effect of intensive treatment of diabetes on the development and progression of long-term complications in insulin-dependent diabetes mellitus. *N Engl J Med* 329:977–986, 1993
11. The DCCT Research Group: Effect of intensive diabetes management on macrovascular events and risk factors in the Diabetes Control and Complications Trial. *Am J Cardiol* 75:894–903, 1995
12. Epidemiology of Diabetes Interventions and Complications (EDIC) Research Group: Effect of intensive diabetes treatment on carotid artery wall thickness in the epidemiology of diabetes interventions and complications. *Diabetes* 48:383–390, 1999
13. Nathan DM, Lachin J, Cleary P, Orchard T, Brillon DJ, Backlund JY, O'Leary DH, Genuth S; Diabetes Control and Complications Trial; Epidemiology of Diabetes Interventions and Complications Research Group: Intensive diabetes therapy and carotid intima-media thickness in type 1 diabetes mellitus. *N Engl J Med* 348:2294–2303, 2003
14. Zinman B, Orchard T, Cleary P, Genuth S, Jacobson A, Wong N, Detrano R, Backlund JC: Coronary Calcification in the Diabetes Control and Complications Trial/Epidemiology of Diabetes Interventions and Complications (DCCT/EDIC) Cohort. *Diabetologia* 46 (Suppl. 2):A23;59, 2003
15. Kanters SD, Algra A, Banga JD: Carotid intima-media thickness in hyperlipidemic type I and type II diabetic patients. *Diabetes Care* 20:276–280, 1997
16. Yamasaki Y, Kawamori R, Matsushima H, Nishizawa H, Kodama M, Kajimoto Y, Morishima T, Kamada T: Atherosclerosis in carotid artery of young IDDM patients monitored by ultrasound high-resolution B-mode imaging. *Diabetes* 43:634–639, 1994
17. Peppa-Patrikiou M, Scordili M, Antoniou A, Giannaki M, Dracopoulou M, Dacou-Voutetakis C: Carotid atherosclerosis in adolescents and young adults with IDDM: relation to urinary endothelin, albumin, free cortisol, and other factors. *Diabetes Care* 21:1004–1007, 1998
18. Olson JC, Edmundowicz D, Becker DJ, Kuller LH, Orchard TJ: Coronary calcium in adults with type 1 diabetes: a stronger correlate of clinical coronary artery disease in men than in women. *Diabetes* 49:1571–1578, 2000
19. Colhoun HM, Rubens MR, Underwood R, Fuller JH: The effect of type 1 diabetes mellitus on the gender difference in coronary artery calcification. *J Am Coll Cardiol* 36:2160–2167, 2000
20. Snell-Bergeon JK, Hokanson JE, Jensen L, MacKenzie T, Kinney G, Dabelea D, Eckel RH, Ehrlich J, Garg S, Rewers M: Progression of coronary artery calcification in type 1 diabetes: the importance of glycemic control. *Diabetes Care* 26:2923–2928, 2003
21. Nathan DM, Cleary PA, Backlund JY, Genuth SM, Lachin JM, Orchard TJ, Raskin P, Zinman B; Diabetes Control and Complications Trial/Epidemiology of Diabetes Interventions and Complications (DCCT/EDIC) Study Research Group: Intensive diabetes treatment and cardiovascular disease in patients with type 1 diabetes. *N Engl J Med* 353:2643–2653, 2005
22. Agatston AS, Janowitz WH, Hildner FJ, Zusmer NR, Viamonte M Jr, Detrano R: Quantitation of coronary artery calcium using ultrafast computed tomography. *J Am Coll Cardiol* 27:827–832, 1996
23. Steffes M, Cleary P, Goldstein D, Little R, Wiedmeyer HM, Rohlfing C, England J, Bucksa J, Nowicki M: Hemoglobin A1c measurements over nearly two decades: sustaining comparable values throughout the Diabetes Control and Complications Trial and the Epidemiology of Diabetes Interventions and Complications study. *Clin Chem* 51:753–578, 2005
24. O'Leary DH, Polak JF, Kronmal RA, Savage PJ, Borhani NO, Kittner SJ, Tracy R, Gardin JM, Price TR, Furberg CD: Thickening of the carotid wall: a marker for atherosclerosis in the elderly? Cardiovascular Health Study Collaborative Research Group. *Stroke* 27:224–231, 1996
25. Baclund JY, Determan A, Cleary P, for the DCCT/EDIC Research Group: Validation of deaths and reported cardiovascular and cerebrovascular events. *Con Clin Trials* 23:2S, 2003
26. SAS/STAT User's Guide: *Version 8 Edition*. Cary, NC, SAS Inst., 1999
27. Davis PH, Dawson JD, Mahoney LT, Lauer RM: Increased carotid intimal-medial thickness and coronary calcification are related in young and middle-aged adults. *Circulation* 100:838–842, 1999
28. Stokes ME, Davis CS, Kock GG: *Categorical Data Analysis Using the SAS System*. Cary, NC, SAS Institute, 1999
29. Lachin JM: *Biostatistical Methods. The Assessment of Relative Risks*. New York, John Wiley & Sons, 2000
30. Tobin J: Estimation of relationships for limited dependent variables. *Econometrics* 26:24–36, 1958
31. Breen R: *Regression Models. Censored, Sample Selected or Truncated Data*. Thousand Oaks, CA, Sage Publications, 1996
32. Hosmer DW, Lemeshow S: *Applied Logistic Regression*. New York, John Wiley & Sons, 1989
33. Stead AG, MacDonald KG: *Constructing ROC Curves with SAS System*. Durham, NC, Organon Tekmika.
34. Altman DG, Bland JM: Diagnostic tests. I. Sensitivity and specificity. *BMJ* 308:1552, 1994
35. Zweig MH, Campbell G: Receiver-operating characteristics (ROC) plots: a fundamental evaluation tool in clinical medicine. *Clin Chem* 39:561–577, 1993
36. The DCCT Research Group: The relationship of glycemic exposure (HbA1c) to the risk of development and progression of retinopathy in the Diabetes Control and Complications Trial. *Diabetes* 44:968–983, 1995
37. Dabelea D, Kinney G, Snell-Bergeon JK, Hokanson JE, Eckel RH, Ehrlich J, Garg S, Hamman R, Rewers M: Effect of type 1 diabetes on the gender difference in coronary artery calcification: a role for insulin resistance? The Coronary Artery Calcification in Type 1 Diabetes (CACTI) study. *Diabetes* 52:2833–2839, 2003 [erratum *Diabetes* 53:2177, 2004]
38. Steffes M, Molitch M, Chavers B, Cleary P, Lachin J, Genuth S, Nathan D: Sustained effect of intensive treatment of type 1 diabetes mellitus on development and progression of diabetic nephropathy: the Epidemiology of Diabetes Interventions and Complications (EDIC) study. *JAMA* 290:2159–2167, 2003
39. Vlassara H, Palace MR: Diabetes and advanced glycation endproducts. *J Int Med* 251:87–101, 2002
40. Monnier VM, Bautista O, Kenny D, Sell DR, Fogarty J, Dahms W, Cleary P,

Lachin J, Genuth S, the DCCT Skin Collagen Ancillary Study Group: Skin collagen glycation, glycoxidation, and crosslinking are lower in subjects with long-term intensive versus conventional therapy of type 1 diabetes: relevance of glycated collagen products versus HbA1c as markers of diabetic complications. *Diabetes* 48:870–880, 1999
41. Yan SF, Ramasamy R, Naka Y, Schmidt AM: Glycation, inflammation, and RAGE: a scaffold for the macrovascular complications of diabetes and beyond. *Circ Res* 93:1159–1169, 2003
42. Lachin JM, Genuth S, Cleary P, Davis MD, Nathan DM: Retinopathy and nephropathy in patients with type 1 diabetes four years after a trial of intensive therapy. *N Engl J Med* 342:381–389, 2000
43. Becker CR, Kleffel T, Crispin A, Knez A, Young J, Schoepf UJ, Haberl R, Reiser MF: Coronary artery calcium measurement: agreement of multirow detector and electron beam CT. *AJR Am J Roentgenol* 176:1295–1298, 2001
44. Simons DB, Schwartz RS, Edwards WD, Sheedy PF, Breen JF, Rumberger JA: Noninvasive definition of anatomic coronary artery disease by ultrafast computed tomographic scanning: a quantitative pathologic comparison study. *J Am Coll Cardiol* 20:1118–1126, 1992
45. Sangiorgi G, Rumberger JA, Severson A, Edwards WD, Gregorire J, Fitzpatrick L, Schwartz RS: Arterial calcification and not lumen stenosis is highly correlated with atherosclerotic plaque burden in humans: a histologic study of 723 coronary artery segments using nondecalcifying methodology. *J Am Coll Cardiol* 31:126–133, 1998
46. Detrano R, Hsiai T, Wang S, Puentes G, Fallavollita J, Shields P, Stanford W, Wolfkiel C, Georgiou D, Budoff M, Reed J: Prognostic value of coronary calcification and angiographic stenoses in patients undergoing coronary angiography. *J Am Coll Cardiol* 27:285–290, 1996
47. Fiorino AS: Electron-beam computed tomography, coronary artery calcium and evaluation of patients with coronary artery disease. *Ann Int Med* 128:839–847, 1998
48. Wexler L, Brundage B, Crouse J, Detrano R, Fuster V, Maddahi Jamshid, Rumberger J, Stanford W, White R, Taubert K, AHA Staff: Coronary artery calcification: pathophysiology, epidemiology, imaging methods, and clinical implications. *Circulation* 94:1175–1192, 1996
49. Arad Y, Spadaro LA, Goodman K, Newstein D, Guerci AD: Prediction of coronary events with electron beam computed tomography. *J Am Coll Cardiol* 36:1253–1260, 2000
50. Clouse ME: How useful is computed tomography for screening for coronary artery disease? *Circulation* 113:125–135, 2006
51. Chen J, Krumholz JM: Screening for coronary artery disease with electron-beam computed tomography is not useful. *Circulation* 113: 135–146, 2006

Attachment 2

SAS 9.1 Log
for programming code submitted
for the replication of results
in Tables 1 and 2 in
Cleary PA, et.al. [Dec 2006]

```
1                                          The SAS System              19:32 Friday, July 31,
2009

NOTE: Copyright (c) 2002-2003 by SAS Institute Inc., Cary, NC, USA.
NOTE: SAS (r) 9.1 (TS1M3)
      Licensed to RTI INTERNATIONAL, Site 0047670001.
NOTE: This session is executing on the XP_PRO  platform.



NOTE: SAS 9.1.3 Service Pack 4

NOTE: SAS initialization used:
      real time           1.36 seconds
      cpu time            0.34 seconds

1          * Filename:  EDICCardio.SAS
2            Location:  ...\niddk2\05_Users\Sylvia\DCCT_EDIC\IntegCheck\Cardio
3            By:        Sylvia Tan
4            Purpose:   Analysis of integrity of EDIC 8-year Cardio-scan archived dataset
5            in the NIDDK Data Repository
6            Compare results to tables/text/selected figures in paper published by
7            DCCT-EDIC Research Group in 2006 (Diabetes Vol.55)
8            Last updated:  7/31/09 *;
9
10         options ps=55 ls=180 nonumber formchar='|----|+\---+=|-^<>*' mprint
10       ! orientation=portrait;
11
12         libname edicctup 'C:\Documents and Settings\stan\My
12       ! Documents\DATA\NIDDK\EDIC\Cardio\Edic-CT\Cardio-Update 07-09';
NOTE: Libref EDICCTUP was successfully assigned as follows:
      Engine:        V9
      Physical Name: C:\Documents and Settings\stan\My
      Documents\DATA\NIDDK\EDIC\Cardio\Edic-CT\Cardio-Update 07-09
13         *libname EDICCa_x xport
13       ! "Z:\05_Users\Sylvia\DCCT_EDIC\IntegCheck\EDIC_Cardio\edicCT.xpt";
14
15         *proc cimport data=EDICctup.EDICCard infile=EDICCa_x; run;
16
17         data ediccard; set edicctup.edicct;
18           array convlip tchol hdl ldl;
19           array mmollip tchol_mm hdl_mm ldl_mm;
20           do over convlip; mmollip=convlip/38.6; end;
21           trig_MM=trig/88.5;
22           * source:
22       ! http://www.sydpath.stvincents.com.au/other/Conversions/ConversionMasterF3Mid.htm *;
23           if sex='M' then male=1; else if sex='F' then male=0;
24           if retbase='PRIM' then retprim=1; else if retbase='SCND' then retprim=0;

NOTE: Missing values were generated as a result of performing an operation on missing values.
      Each place is given by: (Number of times) at (Line):(Column).
      11 at 20:35   1 at 21:15
NOTE: There were 1205 observations read from the data set EDICCTUP.EDICCT.
NOTE: The data set WORK.EDICCARD has 1205 observations and 53 variables.
NOTE: DATA statement used (Total process time):
      real time           0.01 seconds
```

```
      cpu time            0.01 seconds


25         proc sort; by sex;
26
27         * to replicate results in Publication Table 1, p.3558 *;

NOTE: There were 1205 observations read from the data set WORK.EDICCARD.
NOTE: The data set WORK.EDICCARD has 1205 observations and 53 variables.
NOTE: PROCEDURE SORT used (Total process time):
      real time           0.07 seconds
      cpu time            0.01 seconds


28         proc means data=ediccard maxdec=3; class sex group;
29           var age0 DCCT_FUY EDIC_FUY aer0 DURMN0
30           ATT_AGE durn_yrs bmi whratio sbp dbp
31            COMMYR6 COMINT6A tchol_MM hdl_MM ldl_MM lhratio trig_MM
32            aer HBAEL DCCT_HBA HBAM999 EDICMHBA HBA1C WTMHBA; run;

NOTE: There were 1205 observations read from the data set WORK.EDICCARD.
NOTE: The PROCEDURE MEANS printed pages 1-12.
NOTE: PROCEDURE MEANS used (Total process time):
      real time           0.34 seconds
      cpu time            0.03 seconds


33            * note: common carotid <COMMYR6> was reported in Table 1, see note from DCC
below *;
34         proc freq data=EDICCard; by sex; tables group*(retbase
35         smoking AARLT09 ht aspirin meno PARTYII hlip /* <= this is hypercholesterimia */
36         aer40); run;

NOTE: There were 1205 observations read from the data set WORK.EDICCARD.
NOTE: The PROCEDURE FREQ printed pages 13-22.
NOTE: PROCEDURE FREQ used (Total process time):
      real time           0.12 seconds
      cpu time            0.00 seconds


37
38         * to replicate results in Publication Table 2, p.3561 *;
39         proc corr pearson spearman; var ctgt0 ctgt200 logct;
40           with att_age; partial male; run;

NOTE: The PROCEDURE CORR printed page 23.
NOTE: PROCEDURE CORR used (Total process time):
      real time           0.01 seconds
      cpu time            0.01 seconds


41         proc corr pearson spearman; var ctgt0 ctgt200 logct;
42           with male; partial age0; run;
```

```
NOTE: The PROCEDURE CORR printed page 24.
NOTE: PROCEDURE CORR used (Total process time):
      real time           0.00 seconds
      cpu time            0.00 seconds


43         proc corr pearson spearman; var ctgt0 ctgt200 logct;
44           with age0; partial male; run;

NOTE: The PROCEDURE CORR printed page 25.
NOTE: PROCEDURE CORR used (Total process time):
      real time           0.00 seconds
      cpu time            0.00 seconds


45         proc corr pearson spearman data=ediccard ; var ctgt0 ctgt200 logct;
46           with smoking
47           retprim aer0 durmn0
48           DCCT_FUY EDIC_FUY;
49           partial age0 male; run;

NOTE: The PROCEDURE CORR printed pages 26-27.
NOTE: PROCEDURE CORR used (Total process time):
      real time           0.01 seconds
      cpu time            0.01 seconds


50         %macro spcorr(var);
51         proc corr spearman data=ediccard; var ctgt0 ctgt200 logct;
52           with &var; partial age0 male; run;
53         %mend;
54         %spcorr(durn_yrs);
MPRINT(SPCORR):   proc corr spearman data=ediccard;
MPRINT(SPCORR):   var ctgt0 ctgt200 logct;
MPRINT(SPCORR):   with durn_yrs;
MPRINT(SPCORR):   partial age0 male;
MPRINT(SPCORR):   run;

NOTE: The PROCEDURE CORR printed page 28.
NOTE: PROCEDURE CORR used (Total process time):
      real time           0.01 seconds
      cpu time            0.01 seconds


55         %spcorr(weight);
MPRINT(SPCORR):   proc corr spearman data=ediccard;
MPRINT(SPCORR):   var ctgt0 ctgt200 logct;
MPRINT(SPCORR):   with weight;
MPRINT(SPCORR):   partial age0 male;
MPRINT(SPCORR):   run;

NOTE: The PROCEDURE CORR printed page 29.
NOTE: PROCEDURE CORR used (Total process time):
```

```
      real time           0.00 seconds
      cpu time            0.00 seconds


56         %spcorr(height);
MPRINT(SPCORR):   proc corr spearman data=ediccard;
MPRINT(SPCORR):   var ctgt0 ctgt200 logct;
MPRINT(SPCORR):   with height;
MPRINT(SPCORR):   partial age0 male;
MPRINT(SPCORR):   run;

NOTE: The PROCEDURE CORR printed page 30.
NOTE: PROCEDURE CORR used (Total process time):
      real time           0.00 seconds
      cpu time            0.00 seconds


57         %spcorr(bmi);
MPRINT(SPCORR):   proc corr spearman data=ediccard;
MPRINT(SPCORR):   var ctgt0 ctgt200 logct;
MPRINT(SPCORR):   with bmi;
MPRINT(SPCORR):   partial age0 male;
MPRINT(SPCORR):   run;

NOTE: The PROCEDURE CORR printed page 31.
NOTE: PROCEDURE CORR used (Total process time):
      real time           0.00 seconds
      cpu time            0.00 seconds


58         %spcorr(whratio);
MPRINT(SPCORR):   proc corr spearman data=ediccard;
MPRINT(SPCORR):   var ctgt0 ctgt200 logct;
MPRINT(SPCORR):   with whratio;
MPRINT(SPCORR):   partial age0 male;
MPRINT(SPCORR):   run;

NOTE: The PROCEDURE CORR printed page 32.
NOTE: PROCEDURE CORR used (Total process time):
      real time           0.01 seconds
      cpu time            0.01 seconds


59         %spcorr(aaratio);
MPRINT(SPCORR):   proc corr spearman data=ediccard;
MPRINT(SPCORR):   var ctgt0 ctgt200 logct;
MPRINT(SPCORR):   with aaratio;
MPRINT(SPCORR):   partial age0 male;
MPRINT(SPCORR):   run;

NOTE: The PROCEDURE CORR printed page 33.
NOTE: PROCEDURE CORR used (Total process time):
      real time           0.01 seconds
```

```
      cpu time            0.01 seconds


60         %spcorr(hdl_mm);
MPRINT(SPCORR):   proc corr spearman data=ediccard;
MPRINT(SPCORR):   var ctgt0 ctgt200 logct;
MPRINT(SPCORR):   with hdl_mm;
MPRINT(SPCORR):   partial age0 male;
MPRINT(SPCORR):   run;

NOTE: The PROCEDURE CORR printed page 34.
NOTE: PROCEDURE CORR used (Total process time):
      real time           0.00 seconds
      cpu time            0.00 seconds


61         %spcorr(ldl_mm);
MPRINT(SPCORR):   proc corr spearman data=ediccard;
MPRINT(SPCORR):   var ctgt0 ctgt200 logct;
MPRINT(SPCORR):   with ldl_mm;
MPRINT(SPCORR):   partial age0 male;
MPRINT(SPCORR):   run;

NOTE: The PROCEDURE CORR printed page 35.
NOTE: PROCEDURE CORR used (Total process time):
      real time           0.00 seconds
      cpu time            0.00 seconds


62         %spcorr(tchol_mm);
MPRINT(SPCORR):   proc corr spearman data=ediccard;
MPRINT(SPCORR):   var ctgt0 ctgt200 logct;
MPRINT(SPCORR):   with tchol_mm;
MPRINT(SPCORR):   partial age0 male;
MPRINT(SPCORR):   run;

NOTE: The PROCEDURE CORR printed page 36.
NOTE: PROCEDURE CORR used (Total process time):
      real time           0.01 seconds
      cpu time            0.01 seconds


63         %spcorr(lhratio);
MPRINT(SPCORR):   proc corr spearman data=ediccard;
MPRINT(SPCORR):   var ctgt0 ctgt200 logct;
MPRINT(SPCORR):   with lhratio;
MPRINT(SPCORR):   partial age0 male;
MPRINT(SPCORR):   run;

NOTE: The PROCEDURE CORR printed page 37.
NOTE: PROCEDURE CORR used (Total process time):
      real time           0.00 seconds
      cpu time            0.00 seconds
```

```
64         %spcorr(trig_mm);
MPRINT(SPCORR):   proc corr spearman data=ediccard;
MPRINT(SPCORR):   var ctgt0 ctgt200 logct;
MPRINT(SPCORR):   with trig_mm;
MPRINT(SPCORR):   partial age0 male;
MPRINT(SPCORR):   run;

NOTE: The PROCEDURE CORR printed page 38.
NOTE: PROCEDURE CORR used (Total process time):
      real time           0.00 seconds
      cpu time            0.00 seconds


65         %spcorr(hlip);
MPRINT(SPCORR):   proc corr spearman data=ediccard;
MPRINT(SPCORR):   var ctgt0 ctgt200 logct;
MPRINT(SPCORR):   with hlip;
MPRINT(SPCORR):   partial age0 male;
MPRINT(SPCORR):   run;

NOTE: The PROCEDURE CORR printed page 39.
NOTE: PROCEDURE CORR used (Total process time):
      real time           0.01 seconds
      cpu time            0.01 seconds


66         %spcorr(sbp);
MPRINT(SPCORR):   proc corr spearman data=ediccard;
MPRINT(SPCORR):   var ctgt0 ctgt200 logct;
MPRINT(SPCORR):   with sbp;
MPRINT(SPCORR):   partial age0 male;
MPRINT(SPCORR):   run;

NOTE: The PROCEDURE CORR printed page 40.
NOTE: PROCEDURE CORR used (Total process time):
      real time           0.00 seconds
      cpu time            0.00 seconds


67         %spcorr(dbp);
MPRINT(SPCORR):   proc corr spearman data=ediccard;
MPRINT(SPCORR):   var ctgt0 ctgt200 logct;
MPRINT(SPCORR):   with dbp;
MPRINT(SPCORR):   partial age0 male;
MPRINT(SPCORR):   run;

NOTE: The PROCEDURE CORR printed page 41.
NOTE: PROCEDURE CORR used (Total process time):
      real time           0.00 seconds
      cpu time            0.00 seconds
```

```
68         %spcorr(ht);
MPRINT(SPCORR):   proc corr spearman data=ediccard;
MPRINT(SPCORR):   var ctgt0 ctgt200 logct;
MPRINT(SPCORR):   with ht;
MPRINT(SPCORR):   partial age0 male;
MPRINT(SPCORR):   run;

NOTE: The PROCEDURE CORR printed page 42.
NOTE: PROCEDURE CORR used (Total process time):
      real time           0.00 seconds
      cpu time            0.00 seconds


69         %spcorr(aer40);
MPRINT(SPCORR):   proc corr spearman data=ediccard;
MPRINT(SPCORR):   var ctgt0 ctgt200 logct;
MPRINT(SPCORR):   with aer40;
MPRINT(SPCORR):   partial age0 male;
MPRINT(SPCORR):   run;

NOTE: The PROCEDURE CORR printed page 43.
NOTE: PROCEDURE CORR used (Total process time):
      real time           0.01 seconds
      cpu time            0.01 seconds


70         %spcorr(COMINT6A); * combined IMT:  used in Table 2 *;
MPRINT(SPCORR):   proc corr spearman data=ediccard;
MPRINT(SPCORR):   var ctgt0 ctgt200 logct;
MPRINT(SPCORR):   with COMINT6A;
MPRINT(SPCORR):   partial age0 male;
MPRINT(SPCORR):   run;

NOTE: The PROCEDURE CORR printed page 44.
NOTE: PROCEDURE CORR used (Total process time):
      real time           0.00 seconds
      cpu time            0.00 seconds


71         %spcorr(aspirin);
MPRINT(SPCORR):   proc corr spearman data=ediccard;
MPRINT(SPCORR):   var ctgt0 ctgt200 logct;
MPRINT(SPCORR):   with aspirin;
MPRINT(SPCORR):   partial age0 male;
MPRINT(SPCORR):   run;

NOTE: The PROCEDURE CORR printed page 45.
NOTE: PROCEDURE CORR used (Total process time):
      real time           0.00 seconds
      cpu time            0.00 seconds
```

```
72         proc corr pearson spearman; var ctgt0 ctgt200 logct;
73           with meno; partial age0; where male=0; run;

NOTE: The PROCEDURE CORR printed page 46.
NOTE: PROCEDURE CORR used (Total process time):
      real time           0.11 seconds
      cpu time            0.01 seconds


74         %spcorr(partyii);
MPRINT(SPCORR):   proc corr spearman data=ediccard;
MPRINT(SPCORR):   var ctgt0 ctgt200 logct;
MPRINT(SPCORR):   with partyii;
MPRINT(SPCORR):   partial age0 male;
MPRINT(SPCORR):   run;

NOTE: The PROCEDURE CORR printed page 47.
NOTE: PROCEDURE CORR used (Total process time):
      real time           0.00 seconds
      cpu time            0.00 seconds


75         %spcorr(hbael);
MPRINT(SPCORR):   proc corr spearman data=ediccard;
MPRINT(SPCORR):   var ctgt0 ctgt200 logct;
MPRINT(SPCORR):   with hbael;
MPRINT(SPCORR):   partial age0 male;
MPRINT(SPCORR):   run;

NOTE: The PROCEDURE CORR printed page 48.
NOTE: PROCEDURE CORR used (Total process time):
      real time           0.00 seconds
      cpu time            0.00 seconds


76         %spcorr(dcct_hba);
MPRINT(SPCORR):   proc corr spearman data=ediccard;
MPRINT(SPCORR):   var ctgt0 ctgt200 logct;
MPRINT(SPCORR):   with dcct_hba;
MPRINT(SPCORR):   partial age0 male;
MPRINT(SPCORR):   run;

NOTE: The PROCEDURE CORR printed page 49.
NOTE: PROCEDURE CORR used (Total process time):
      real time           0.01 seconds
      cpu time            0.01 seconds


77         %spcorr(hbam999);
MPRINT(SPCORR):   proc corr spearman data=ediccard;
MPRINT(SPCORR):   var ctgt0 ctgt200 logct;
MPRINT(SPCORR):   with hbam999;
MPRINT(SPCORR):   partial age0 male;
```

```
MPRINT(SPCORR):   run;

NOTE: The PROCEDURE CORR printed page 50.
NOTE: PROCEDURE CORR used (Total process time):
      real time           0.00 seconds
      cpu time            0.00 seconds


78         %spcorr(edicmhba);
MPRINT(SPCORR):   proc corr spearman data=ediccard;
MPRINT(SPCORR):   var ctgt0 ctgt200 logct;
MPRINT(SPCORR):   with edicmhba;
MPRINT(SPCORR):   partial age0 male;
MPRINT(SPCORR):   run;

NOTE: The PROCEDURE CORR printed page 51.
NOTE: PROCEDURE CORR used (Total process time):
      real time           0.00 seconds
      cpu time            0.00 seconds


79         %spcorr(hba1c);
MPRINT(SPCORR):   proc corr spearman data=ediccard;
MPRINT(SPCORR):   var ctgt0 ctgt200 logct;
MPRINT(SPCORR):   with hba1c;
MPRINT(SPCORR):   partial age0 male;
MPRINT(SPCORR):   run;

NOTE: The PROCEDURE CORR printed page 52.
NOTE: PROCEDURE CORR used (Total process time):
      real time           0.01 seconds
      cpu time            0.01 seconds


80         %spcorr(wtmhba);
MPRINT(SPCORR):   proc corr spearman data=ediccard;
MPRINT(SPCORR):   var ctgt0 ctgt200 logct;
MPRINT(SPCORR):   with wtmhba;
MPRINT(SPCORR):   partial age0 male;
MPRINT(SPCORR):   run;

NOTE: The PROCEDURE CORR printed page 53.
NOTE: PROCEDURE CORR used (Total process time):
      real time           0.00 seconds
      cpu time            0.00 seconds


81
82         * msg from DCC:
83         >Date: Fri, 19 Jun 2009 12:11:26 -0400
84         >Subject: RE: EDIC Cardio file -- question
85         >
86         >
```

```
87         >The variable of "Combined carotid IMT year 6" in Table 2 should be
88         >COMINT6A, instead of COMMYR6, which was used in Table 1.  I used both
89         >common and combined IMT for Tables 1& 2, but only one of the IMT
90         >variables made it in the final version of the paper. ...
91         >Table 1 kept common IMT and Table 2 kept the combined one.
92         >
93         *;

NOTE: SAS Institute Inc., SAS Campus Drive, Cary, NC USA 27513-2414
NOTE: The SAS System used:
      real time           3.95 seconds
      cpu time            0.68 seconds
```

Attachment 3

SAS 9.1 Output
for programming code submitted
for the replication of results
in Tables 1 and 2 in
Cleary PA, et.al. [Dec 2006]

The MEANS Procedure

SEX (FM)	TREATMENT GROUP	N Obs	Variable	Label	N
F	EXPERIMENTAL	297	AGE0	AGE AT ENTRY INTO DCCT (YEARS)	297
			DCCT_FUY	DCCT FOLLOW-UP YEARS	297
			EDIC_FUY	EDIC FOLLOW-UP YEARS	297
			AER0	AER (MG/24HR) AT DCCT BASELINE	297
			DURMN0	DIABETES DURATION (MONTHS) AT DCCT BASELINE	297
			ATT_AGE	ATTAINED AGE UP TO CT SCAN DATE (YEARS)	297
			DURN_YRS	DIABETES DURATION (YEARS)	297
			BMI	BODY MASS INDEX (KG/M2)	296
			WHRATIO	NATURAL WAIST TO HIP RATIO	293
			SBP	SYSTOLIC BLOOD PRESSURE (MM HG)	297
			DBP	DIASTOLIC BLOOD PRESSURE (MM HG)	297
			COMMYR6	COMMON CAROTID IMT YEAR 6	266
			COMINT6A	COMBINED CAROTID IMT YEAR 6	269
			tchol_mm		297
			hdl_mm		297
			ldl_mm		294
			LHRATIO	LDL/HDL RATIO	294
			trig_MM		297
			AER	AER (MG/24HR) AT VISIT PRIOR TO CT	297
			HBAEL	HEMOGLOBIN A1C AT DCCT ELIGIBILITY	297
			DCCT_HBA	HEMOGLOBIN A1C MEAN DURING DCCT	297
			HBAM999	HEMOGLOBIN A1C AT DCCT CLOSE-OUT	296
			EDICMHBA	HEMOGLOBIN A1C MEAN DURING EDIC	297
			HBA1C	HEMOGLOBIN A1C AT VISIT PRIOR TO CT	297
			WTMHBA	HEMOGLOBIN A1C WEIGHTED MEAN DURING DCCT EDIC	297
	STANDARD	275	AGE0	AGE AT ENTRY INTO DCCT (YEARS)	275
			DCCT_FUY	DCCT FOLLOW-UP YEARS	275
			EDIC_FUY	EDIC FOLLOW-UP YEARS	275
			AER0	AER (MG/24HR) AT DCCT BASELINE	275
			DURMN0	DIABETES DURATION (MONTHS) AT DCCT BASELINE	275
			ATT_AGE	ATTAINED AGE UP TO CT SCAN DATE (YEARS)	275
			DURN_YRS	DIABETES DURATION (YEARS)	275
			BMI	BODY MASS INDEX (KG/M2)	267
			WHRATIO	NATURAL WAIST TO HIP RATIO	270
			SBP	SYSTOLIC BLOOD PRESSURE (MM HG)	273
			DBP	DIASTOLIC BLOOD PRESSURE (MM HG)	273
			COMMYR6	COMMON CAROTID IMT YEAR 6	253
			COMINT6A	COMBINED CAROTID IMT YEAR 6	255
			tchol_mm		275
			hdl_mm		275
			ldl_mm		273
			LHRATIO	LDL/HDL RATIO	273
			trig_MM		275
			AER	AER (MG/24HR) AT VISIT PRIOR TO CT	275
			HBAEL	HEMOGLOBIN A1C AT DCCT ELIGIBILITY	275

The MEANS Procedure

SEX (F/M)	TREATMENT GROUP	N Obs	Variable	Label	N
F	STANDARD	275	DCCT_HBA	HEMOGLOBIN A1C MEAN DURING DCCT	275
			HBAM999	HEMOGLOBIN A1C AT DCCT CLOSE-OUT	275
			EDICMHBA	HEMOGLOBIN A1C MEAN DURING EDIC	275
			HBA1C	HEMOGLOBIN A1C AT VISIT PRIOR TO CT	275
			WTMHBA	HEMOGLOBIN A1C WEIGHTED MEAN DURING DCCT EDIC	275
M	EXPERIMENTAL	300	AGE0	AGE AT ENTRY INTO DCCT (YEARS)	300
			DCCT_FUY	DCCT FOLLOW-UP YEARS	300
			EDIC_FUY	EDIC FOLLOW-UP YEARS	300
			AER0	AER (MG/24HR) AT DCCT BASELINE	300
			DURMN0	DIABETES DURATION (MONTHS) AT DCCT BASELINE	300
			ATT_AGE	ATTAINED AGE UP TO CT SCAN DATE (YEARS)	300
			DURN_YRS	DIABETES DURATION (YEARS)	300
			BMI	BODY MASS INDEX (KG/M2)	297
			WHRATIO	NATURAL WAIST TO HIP RATIO	296
			SBP	SYSTOLIC BLOOD PRESSURE (MM HG)	300
			DBP	DIASTOLIC BLOOD PRESSURE (MM HG)	300
			COMMYR6	COMMON CAROTID IMT YEAR 6	281
			COMINT6A	COMBINED CAROTID IMT YEAR 6	282
			tchol_mm		300
			hdl_mm		300
			ldl_mm		297
			LHRATIO	LDL/HDL RATIO	297
			trig_MM		300
			AER	AER (MG/24HR) AT VISIT PRIOR TO CT	300
			HBAEL	HEMOGLOBIN A1C AT DCCT ELIGIBILITY	300
			DCCT_HBA	HEMOGLOBIN A1C MEAN DURING DCCT	300
			HBAM999	HEMOGLOBIN A1C AT DCCT CLOSE-OUT	300
			EDICMHBA	HEMOGLOBIN A1C MEAN DURING EDIC	300
			HBA1C	HEMOGLOBIN A1C AT VISIT PRIOR TO CT	300
			WTMHBA	HEMOGLOBIN A1C WEIGHTED MEAN DURING DCCT EDIC	300
	STANDARD	333	AGE0	AGE AT ENTRY INTO DCCT (YEARS)	333
			DCCT_FUY	DCCT FOLLOW-UP YEARS	333
			EDIC_FUY	EDIC FOLLOW-UP YEARS	333
			AER0	AER (MG/24HR) AT DCCT BASELINE	333
			DURMN0	DIABETES DURATION (MONTHS) AT DCCT BASELINE	333
			ATT_AGE	ATTAINED AGE UP TO CT SCAN DATE (YEARS)	333
			DURN_YRS	DIABETES DURATION (YEARS)	333
			BMI	BODY MASS INDEX (KG/M2)	332
			WHRATIO	NATURAL WAIST TO HIP RATIO	330
			SBP	SYSTOLIC BLOOD PRESSURE (MM HG)	332
			DBP	DIASTOLIC BLOOD PRESSURE (MM HG)	332
			COMMYR6	COMMON CAROTID IMT YEAR 6	294
			COMINT6A	COMBINED CAROTID IMT YEAR 6	297
			tchol_mm		332

The MEANS Procedure

SEX (F/M)	TREATMENT GROUP	N Obs	Variable	Label	N
M	STANDARD	333	hdl_mm		332
			ldl_mm		332
			LHRATIO	LDL/HDL RATIO	332
			trig_MM		332
			AER	AER (MG/24HR) AT VISIT PRIOR TO CT	333
			HBAEL	HEMOGLOBIN A1C AT DCCT ELIGIBILITY	333
			DCCT_HBA	HEMOGLOBIN A1C MEAN DURING DCCT	333
			HBAM999	HEMOGLOBIN A1C AT DCCT CLOSE-OUT	332
			EDICMHBA	HEMOGLOBIN A1C MEAN DURING EDIC	333
			HBA1C	HEMOGLOBIN A1C AT VISIT PRIOR TO CT	333
			WTMHBA	HEMOGLOBIN A1C WEIGHTED MEAN DURING DCCT EDIC	333

SEX (F/M)	TREATMENT GROUP	N Obs	Variable	Label	Mean
F	EXPERIMENTAL	297	AGE0	AGE AT ENTRY INTO DCCT (YEARS)	27.404
			DCCT_FUY	DCCT FOLLOW-UP YEARS	6.368
			EDIC_FUY	EDIC FOLLOW-UP YEARS	9.165
			AER0	AER (MG/24HR) AT DCCT BASELINE	16.155
			DURMN0	DIABETES DURATION (MONTHS) AT DCCT BASELINE	69.108
			ATT_AGE	ATTAINED AGE UP TO CT SCAN DATE (YEARS)	43.148
			DURN_YRS	DIABETES DURATION (YEARS)	21.292
			BMI	BODY MASS INDEX (KG/M2)	27.452
			WHRATIO	NATURAL WAIST TO HIP RATIO	0.788
			SBP	SYSTOLIC BLOOD PRESSURE (MM HG)	119.694
			DBP	DIASTOLIC BLOOD PRESSURE (MM HG)	74.803
			COMMYR6	COMMON CAROTID IMT YEAR 6	0.597
			COMINT6A	COMBINED CAROTID IMT YEAR 6	-0.376
			tchol_mm		4.940
			hdl_mm		1.591
			ldl_mm		2.890
			LHRATIO	LDL/HDL RATIO	1.934
			trig_MM		0.953
			AER	AER (MG/24HR) AT VISIT PRIOR TO CT	35.530
			HBAEL	HEMOGLOBIN A1C AT DCCT ELIGIBILITY	9.157
			DCCT_HBA	HEMOGLOBIN A1C MEAN DURING DCCT	7.290
			HBAM999	HEMOGLOBIN A1C AT DCCT CLOSE-OUT	7.305
			EDICMHBA	HEMOGLOBIN A1C MEAN DURING EDIC	8.075
			HBA1C	HEMOGLOBIN A1C AT VISIT PRIOR TO CT	8.006
			WTMHBA	HEMOGLOBIN A1C WEIGHTED MEAN DURING DCCT EDIC	7.764
	STANDARD	275	AGE0	AGE AT ENTRY INTO DCCT (YEARS)	26.120
			DCCT_FUY	DCCT FOLLOW-UP YEARS	6.272
			EDIC_FUY	EDIC FOLLOW-UP YEARS	9.128

The MEANS Procedure

SEX (F M)	TREATMENT GROUP	N Obs	Variable	Label	Mean
F	STANDARD	275	AER0	AER (MG/24HR) AT DCCT BASELINE	15.102
			DURMN0	DIABETES DURATION (MONTHS) AT DCCT BASELINE	71.164
			ATT_AGE	ATTAINED AGE UP TO CT SCAN DATE (YEARS)	41.858
			DURN_YRS	DIABETES DURATION (YEARS)	21.332
			BMI	BODY MASS INDEX (KG/M2)	26.665
			WHRATIO	NATURAL WAIST TO HIP RATIO	0.783
			SBP	SYSTOLIC BLOOD PRESSURE (MM HG)	120.412
			DBP	DIASTOLIC BLOOD PRESSURE (MM HG)	74.401
			COMMYR6	COMMON CAROTID IMT YEAR 6	0.592
			COMINT6A	COMBINED CAROTID IMT YEAR 6	-0.314
			tchol_mm		4.834
			hdl_mm		1.624
			ldl_mm		2.807
			LHRATIO	LDL/HDL RATIO	1.829
			trig_MM		0.890
			AER	AER (MG/24HR) AT VISIT PRIOR TO CT	84.363
			HBAEL	HEMOGLOBIN A1C AT DCCT ELIGIBILITY	9.123
			DCCT_HBA	HEMOGLOBIN A1C MEAN DURING DCCT	9.136
			HBAM999	HEMOGLOBIN A1C AT DCCT CLOSE-OUT	9.126
			EDICMHBA	HEMOGLOBIN A1C MEAN DURING EDIC	8.124
			HBA1C	HEMOGLOBIN A1C AT VISIT PRIOR TO CT	7.922
			WTMHBA	HEMOGLOBIN A1C WEIGHTED MEAN DURING DCCT EDIC	8.529
M	EXPERIMENTAL	300	AGE0	AGE AT ENTRY INTO DCCT (YEARS)	27.587
			DCCT_FUY	DCCT FOLLOW-UP YEARS	6.367
			EDIC_FUY	EDIC FOLLOW-UP YEARS	9.132
			AER0	AER (MG/24HR) AT DCCT BASELINE	16.810
			DURMN0	DIABETES DURATION (MONTHS) AT DCCT BASELINE	70.317
			ATT_AGE	ATTAINED AGE UP TO CT SCAN DATE (YEARS)	43.343
			DURN_YRS	DIABETES DURATION (YEARS)	21.361
			BMI	BODY MASS INDEX (KG/M2)	28.048
			WHRATIO	NATURAL WAIST TO HIP RATIO	0.907
			SBP	SYSTOLIC BLOOD PRESSURE (MM HG)	123.302
			DBP	DIASTOLIC BLOOD PRESSURE (MM HG)	77.902
			COMMYR6	COMMON CAROTID IMT YEAR 6	0.632
			COMINT6A	COMBINED CAROTID IMT YEAR 6	0.283
			tchol_mm		4.810
			hdl_mm		1.307
			ldl_mm		2.984
			LHRATIO	LDL/HDL RATIO	2.435
			trig_MM		1.149
			AER	AER (MG/24HR) AT VISIT PRIOR TO CT	104.894
			HBAEL	HEMOGLOBIN A1C AT DCCT ELIGIBILITY	8.951
			DCCT_HBA	HEMOGLOBIN A1C MEAN DURING DCCT	7.242
			HBAM999	HEMOGLOBIN A1C AT DCCT CLOSE-OUT	7.357
			EDICMHBA	HEMOGLOBIN A1C MEAN DURING EDIC	7.963

The MEANS Procedure

SEX (FM)	TREATMENT GROUP	N Obs	Variable	Label	Mean
M	EXPERIMENTAL	300	HBA1C	HEMOGLOBIN A1C AT VISIT PRIOR TO CT	7.890
			WTMHBA	HEMOGLOBIN A1C WEIGHTED MEAN DURING DCCT EDIC	7.677
	STANDARD	333	AGE0	AGE AT ENTRY INTO DCCT (YEARS)	27.586
			DCCT_FUY	DCCT FOLLOW-UP YEARS	6.115
			EDIC_FUY	EDIC FOLLOW-UP YEARS	9.176
			AER0	AER (MG/24HR) AT DCCT BASELINE	15.005
			DURMN0	DIABETES DURATION (MONTHS) AT DCCT BASELINE	59.856
			ATT_AGE	ATTAINED AGE UP TO CT SCAN DATE (YEARS)	43.237
			DURN_YRS	DIABETES DURATION (YEARS)	20.281
			BMI	BODY MASS INDEX (KG/M2)	27.799
			WHRATIO	NATURAL WAIST TO HIP RATIO	0.900
			SBP	SYSTOLIC BLOOD PRESSURE (MM HG)	124.816
			DBP	DIASTOLIC BLOOD PRESSURE (MM HG)	78.160
			COMMYR6	COMMON CAROTID IMT YEAR 6	0.653
			COMINT6A	COMBINED CAROTID IMT YEAR 6	0.499
			tchol_mm		4.734
			hdl_mm		1.321
			ldl_mm		2.922
			LHRATIO	LDL/HDL RATIO	2.330
			trig_MM		1.063
			AER	AER (MG/24HR) AT VISIT PRIOR TO CT	233.600
			HBAEL	HEMOGLOBIN A1C AT DCCT ELIGIBILITY	8.845
			DCCT_HBA	HEMOGLOBIN A1C MEAN DURING DCCT	8.947
			HBAM999	HEMOGLOBIN A1C AT DCCT CLOSE-OUT	9.115
			EDICMHBA	HEMOGLOBIN A1C MEAN DURING EDIC	8.162
			HBA1C	HEMOGLOBIN A1C AT VISIT PRIOR TO CT	7.856
			WTMHBA	HEMOGLOBIN A1C WEIGHTED MEAN DURING DCCT EDIC	8.480

SEX (FM)	TREATMENT GROUP	N Obs	Variable	Label	Std Dev
F	EXPERIMENTAL	297	AGE0	AGE AT ENTRY INTO DCCT (YEARS)	6.993
			DCCT_FUY	DCCT FOLLOW-UP YEARS	1.702
			EDIC_FUY	EDIC FOLLOW-UP YEARS	0.492
			AER0	AER (MG/24HR) AT DCCT BASELINE	20.195
			DURMN0	DIABETES DURATION (MONTHS) AT DCCT BASELINE	50.443
			ATT_AGE	ATTAINED AGE UP TO CT SCAN DATE (YEARS)	6.980
			DURN_YRS	DIABETES DURATION (YEARS)	4.907
			BMI	BODY MASS INDEX (KG/M2)	4.806
			WHRATIO	NATURAL WAIST TO HIP RATIO	0.066
			SBP	SYSTOLIC BLOOD PRESSURE (MM HG)	13.843
			DBP	DIASTOLIC BLOOD PRESSURE (MM HG)	8.623
			COMMYR6	COMMON CAROTID IMT YEAR 6	0.106

The MEANS Procedure

SEX (F M)	TREATMENT GROUP	N Obs	Variable	Label	Std Dev
F	EXPERIMENTAL	297	COMINT6A	COMBINED CAROTID IMT YEAR 6	1.331
			tchol_mm		0.955
			hdl_mm		0.382
			ldl_mm		0.763
			LHRATIO	LDL/HDL RATIO	0.758
			trig_MM		0.638
			AER	AER (MG/24HR) AT VISIT PRIOR TO CT	194.344
			HBAEL	HEMOGLOBIN A1C AT DCCT ELIGIBILITY	1.599
			DCCT_HBA	HEMOGLOBIN A1C MEAN DURING DCCT	0.863
			HBAM999	HEMOGLOBIN A1C AT DCCT CLOSE-OUT	0.967
			EDICMHBA	HEMOGLOBIN A1C MEAN DURING EDIC	1.160
			HBA1C	HEMOGLOBIN A1C AT VISIT PRIOR TO CT	1.355
			WTMHBA	HEMOGLOBIN A1C WEIGHTED MEAN DURING DCCT EDIC	0.938
	STANDARD	275	AGE0	AGE AT ENTRY INTO DCCT (YEARS)	7.144
			DCCT_FUY	DCCT FOLLOW-UP YEARS	1.695
			EDIC_FUY	EDIC FOLLOW-UP YEARS	0.497
			AER0	AER (MG/24HR) AT DCCT BASELINE	13.321
			DURMN0	DIABETES DURATION (MONTHS) AT DCCT BASELINE	51.470
			ATT_AGE	ATTAINED AGE UP TO CT SCAN DATE (YEARS)	7.119
			DURN_YRS	DIABETES DURATION (YEARS)	5.092
			BMI	BODY MASS INDEX (KG/M2)	4.484
			WHRATIO	NATURAL WAIST TO HIP RATIO	0.059
			SBP	SYSTOLIC BLOOD PRESSURE (MM HG)	14.726
			DBP	DIASTOLIC BLOOD PRESSURE (MM HG)	9.434
			COMMYR6	COMMON CAROTID IMT YEAR 6	0.103
			COMINT6A	COMBINED CAROTID IMT YEAR 6	1.427
			tchol_mm		0.842
			hdl_mm		0.378
			ldl_mm		0.689
			LHRATIO	LDL/HDL RATIO	0.649
			trig_MM		0.580
			AER	AER (MG/24HR) AT VISIT PRIOR TO CT	370.556
			HBAEL	HEMOGLOBIN A1C AT DCCT ELIGIBILITY	1.672
			DCCT_HBA	HEMOGLOBIN A1C MEAN DURING DCCT	1.357
			HBAM999	HEMOGLOBIN A1C AT DCCT CLOSE-OUT	1.777
			EDICMHBA	HEMOGLOBIN A1C MEAN DURING EDIC	1.220
			HBA1C	HEMOGLOBIN A1C AT VISIT PRIOR TO CT	1.507
			WTMHBA	HEMOGLOBIN A1C WEIGHTED MEAN DURING DCCT EDIC	1.131
M	EXPERIMENTAL	300	AGE0	AGE AT ENTRY INTO DCCT (YEARS)	6.860
			DCCT_FUY	DCCT FOLLOW-UP YEARS	1.708
			EDIC_FUY	EDIC FOLLOW-UP YEARS	0.498
			AER0	AER (MG/24HR) AT DCCT BASELINE	20.622
			DURMN0	DIABETES DURATION (MONTHS) AT DCCT BASELINE	49.766
			ATT_AGE	ATTAINED AGE UP TO CT SCAN DATE (YEARS)	6.694

The MEANS Procedure

SEX (FM)	TREATMENT GROUP	N Obs	Variable	Label	Std Dev
M	EXPERIMENTAL	300	DURN_YRS	DIABETES DURATION (YEARS)	4.904
			BMI	BODY MASS INDEX (KG/M2)	4.383
			WHRATIO	NATURAL WAIST TO HIP RATIO	0.063
			SBP	SYSTOLIC BLOOD PRESSURE (MM HG)	13.514
			DBP	DIASTOLIC BLOOD PRESSURE (MM HG)	9.053
			COMMYR6	COMMON CAROTID IMT YEAR 6	0.102
			COMINT6A	COMBINED CAROTID IMT YEAR 6	1.590
			tchol_mm		0.898
			hdl_mm		0.352
			ldl_mm		0.762
			LHRATIO	LDL/HDL RATIO	0.902
			trig_MM		0.878
			AER	AER (MG/24HR) AT VISIT PRIOR TO CT	730.614
			HBAEL	HEMOGLOBIN A1C AT DCCT ELIGIBILITY	1.558
			DCCT_HBA	HEMOGLOBIN A1C MEAN DURING DCCT	0.892
			HBAM999	HEMOGLOBIN A1C AT DCCT CLOSE-OUT	1.077
			EDICMHBA	HEMOGLOBIN A1C MEAN DURING EDIC	1.130
			HBA1C	HEMOGLOBIN A1C AT VISIT PRIOR TO CT	1.245
			WTMHBA	HEMOGLOBIN A1C WEIGHTED MEAN DURING DCCT EDIC	0.971
	STANDARD	333	AGE0	AGE AT ENTRY INTO DCCT (YEARS)	6.639
			DCCT_FUY	DCCT FOLLOW-UP YEARS	1.623
			EDIC_FUY	EDIC FOLLOW-UP YEARS	0.493
			AER0	AER (MG/24HR) AT DCCT BASELINE	19.947
			DURMN0	DIABETES DURATION (MONTHS) AT DCCT BASELINE	46.318
			ATT_AGE	ATTAINED AGE UP TO CT SCAN DATE (YEARS)	6.611
			DURN_YRS	DIABETES DURATION (YEARS)	4.604
			BMI	BODY MASS INDEX (KG/M2)	3.743
			WHRATIO	NATURAL WAIST TO HIP RATIO	0.061
			SBP	SYSTOLIC BLOOD PRESSURE (MM HG)	14.658
			DBP	DIASTOLIC BLOOD PRESSURE (MM HG)	9.502
			COMMYR6	COMMON CAROTID IMT YEAR 6	0.144
			COMINT6A	COMBINED CAROTID IMT YEAR 6	2.038
			tchol_mm		0.852
			hdl_mm		0.304
			ldl_mm		0.740
			LHRATIO	LDL/HDL RATIO	0.795
			trig_MM		0.611
			AER	AER (MG/24HR) AT VISIT PRIOR TO CT	862.994
			HBAEL	HEMOGLOBIN A1C AT DCCT ELIGIBILITY	1.562
			DCCT_HBA	HEMOGLOBIN A1C MEAN DURING DCCT	1.147
			HBAM999	HEMOGLOBIN A1C AT DCCT CLOSE-OUT	1.305
			EDICMHBA	HEMOGLOBIN A1C MEAN DURING EDIC	1.102
			HBA1C	HEMOGLOBIN A1C AT VISIT PRIOR TO CT	1.317
			WTMHBA	HEMOGLOBIN A1C WEIGHTED MEAN DURING DCCT EDIC	1.005

The MEANS Procedure

SEX (F M)	TREATMENT GROUP	N Obs	Variable	Label	Minimum
F	EXPERIMENTAL	297	AGE0	AGE AT ENTRY INTO DCCT (YEARS)	13.000
			DCCT_FUY	DCCT FOLLOW-UP YEARS	3.617
			EDIC_FUY	EDIC FOLLOW-UP YEARS	7.836
			AER0	AER (MG/24HR) AT DCCT BASELINE	1.440
			DURMN0	DIABETES DURATION (MONTHS) AT DCCT BASELINE	9.000
			ATT_AGE	ATTAINED AGE UP TO CT SCAN DATE (YEARS)	27.000
			DURN_YRS	DIABETES DURATION (YEARS)	13.250
			BMI	BODY MASS INDEX (KG/M2)	17.598
			WHRATIO	NATURAL WAIST TO HIP RATIO	0.617
			SBP	SYSTOLIC BLOOD PRESSURE (MM HG)	76.000
			DBP	DIASTOLIC BLOOD PRESSURE (MM HG)	50.000
			COMMYR6	COMMON CAROTID IMT YEAR 6	0.368
			COMINT6A	COMBINED CAROTID IMT YEAR 6	-3.064
			tchol_mm		3.057
			hdl_mm		0.492
			ldl_mm		1.062
			LHRATIO	LDL/HDL RATIO	0.482
			trig_MM		0.260
			AER	AER (MG/24HR) AT VISIT PRIOR TO CT	1.440
			HBAEL	HEMOGLOBIN A1C AT DCCT ELIGIBILITY	6.560
			DCCT_HBA	HEMOGLOBIN A1C MEAN DURING DCCT	5.498
			HBAM999	HEMOGLOBIN A1C AT DCCT CLOSE-OUT	4.600
			EDICMHBA	HEMOGLOBIN A1C MEAN DURING EDIC	5.711
			HBA1C	HEMOGLOBIN A1C AT VISIT PRIOR TO CT	5.300
			WTMHBA	HEMOGLOBIN A1C WEIGHTED MEAN DURING DCCT EDIC	5.946
	STANDARD	275	AGE0	AGE AT ENTRY INTO DCCT (YEARS)	13.000
			DCCT_FUY	DCCT FOLLOW-UP YEARS	3.551
			EDIC_FUY	EDIC FOLLOW-UP YEARS	7.973
			AER0	AER (MG/24HR) AT DCCT BASELINE	1.440
			DURMN0	DIABETES DURATION (MONTHS) AT DCCT BASELINE	9.000
			ATT_AGE	ATTAINED AGE UP TO CT SCAN DATE (YEARS)	26.000
			DURN_YRS	DIABETES DURATION (YEARS)	13.250
			BMI	BODY MASS INDEX (KG/M2)	18.431
			WHRATIO	NATURAL WAIST TO HIP RATIO	0.617
			SBP	SYSTOLIC BLOOD PRESSURE (MM HG)	91.000
			DBP	DIASTOLIC BLOOD PRESSURE (MM HG)	41.000
			COMMYR6	COMMON CAROTID IMT YEAR 6	0.393
			COMINT6A	COMBINED CAROTID IMT YEAR 6	-2.655
			tchol_mm		2.150
			hdl_mm		0.803
			ldl_mm		1.010
			LHRATIO	LDL/HDL RATIO	0.550
			trig_MM		0.260
			AER	AER (MG/24HR) AT VISIT PRIOR TO CT	1.440
			HBAEL	HEMOGLOBIN A1C AT DCCT ELIGIBILITY	6.580

The MEANS Procedure

SEX (F/M)	TREATMENT GROUP	N Obs	Variable	Label	Minimum
F	STANDARD	275	DCCT_HBA	HEMOGLOBIN A1C MEAN DURING DCCT	5.729
			HBAM999	HEMOGLOBIN A1C AT DCCT CLOSE-OUT	4.100
			EDICMHBA	HEMOGLOBIN A1C MEAN DURING EDIC	5.725
			HBA1C	HEMOGLOBIN A1C AT VISIT PRIOR TO CT	4.600
			WTMHBA	HEMOGLOBIN A1C WEIGHTED MEAN DURING DCCT EDIC	5.769
M	EXPERIMENTAL	300	AGE0	AGE AT ENTRY INTO DCCT (YEARS)	13.000
			DCCT_FUY	DCCT FOLLOW-UP YEARS	3.491
			EDIC_FUY	EDIC FOLLOW-UP YEARS	7.844
			AER0	AER (MG/24HR) AT DCCT BASELINE	1.440
			DURMN0	DIABETES DURATION (MONTHS) AT DCCT BASELINE	9.000
			ATT_AGE	ATTAINED AGE UP TO CT SCAN DATE (YEARS)	27.000
			DURN_YRS	DIABETES DURATION (YEARS)	13.250
			BMI	BODY MASS INDEX (KG/M2)	19.444
			WHRATIO	NATURAL WAIST TO HIP RATIO	0.770
			SBP	SYSTOLIC BLOOD PRESSURE (MM HG)	95.000
			DBP	DIASTOLIC BLOOD PRESSURE (MM HG)	50.000
			COMMYR6	COMMON CAROTID IMT YEAR 6	0.410
			COMINT6A	COMBINED CAROTID IMT YEAR 6	-2.529
			tchol_mm		2.772
			hdl_mm		0.622
			ldl_mm		0.984
			LHRATIO	LDL/HDL RATIO	0.644
			trig_MM		0.316
			AER	AER (MG/24HR) AT VISIT PRIOR TO CT	1.440
			HBAEL	HEMOGLOBIN A1C AT DCCT ELIGIBILITY	6.590
			DCCT_HBA	HEMOGLOBIN A1C MEAN DURING DCCT	5.395
			HBAM999	HEMOGLOBIN A1C AT DCCT CLOSE-OUT	5.100
			EDICMHBA	HEMOGLOBIN A1C MEAN DURING EDIC	5.733
			HBA1C	HEMOGLOBIN A1C AT VISIT PRIOR TO CT	5.100
			WTMHBA	HEMOGLOBIN A1C WEIGHTED MEAN DURING DCCT EDIC	5.752
	STANDARD	333	AGE0	AGE AT ENTRY INTO DCCT (YEARS)	13.000
			DCCT_FUY	DCCT FOLLOW-UP YEARS	2.543
			EDIC_FUY	EDIC FOLLOW-UP YEARS	7.855
			AER0	AER (MG/24HR) AT DCCT BASELINE	1.440
			DURMN0	DIABETES DURATION (MONTHS) AT DCCT BASELINE	8.000
			ATT_AGE	ATTAINED AGE UP TO CT SCAN DATE (YEARS)	27.000
			DURN_YRS	DIABETES DURATION (YEARS)	13.417
			BMI	BODY MASS INDEX (KG/M2)	18.429
			WHRATIO	NATURAL WAIST TO HIP RATIO	0.756
			SBP	SYSTOLIC BLOOD PRESSURE (MM HG)	91.000
			DBP	DIASTOLIC BLOOD PRESSURE (MM HG)	44.000
			COMMYR6	COMMON CAROTID IMT YEAR 6	0.428
			COMINT6A	COMBINED CAROTID IMT YEAR 6	-2.292
			tchol_mm		2.332

The MEANS Procedure

SEX (F/M)	TREATMENT GROUP	N Obs	Variable	Label	Minimum
M	STANDARD	333	hdl_mm		0.699
			ldl_mm		0.933
			LHRATIO	LDL/HDL RATIO	0.735
			trig_MM		0.226
			AER	AER (MG/24HR) AT VISIT PRIOR TO CT	1.440
			HBAEL	HEMOGLOBIN A1C AT DCCT ELIGIBILITY	6.600
			DCCT_HBA	HEMOGLOBIN A1C MEAN DURING DCCT	6.284
			HBAM999	HEMOGLOBIN A1C AT DCCT CLOSE-OUT	5.900
			EDICMHBA	HEMOGLOBIN A1C MEAN DURING EDIC	5.490
			HBA1C	HEMOGLOBIN A1C AT VISIT PRIOR TO CT	4.500
			WTMHBA	HEMOGLOBIN A1C WEIGHTED MEAN DURING DCCT EDIC	5.713

SEX (F/M)	TREATMENT GROUP	N Obs	Variable	Label	Maximum
F	EXPERIMENTAL	297	AGE0	AGE AT ENTRY INTO DCCT (YEARS)	39.000
			DCCT_FUY	DCCT FOLLOW-UP YEARS	9.506
			EDIC_FUY	EDIC FOLLOW-UP YEARS	10.108
			AER0	AER (MG/24HR) AT DCCT BASELINE	151.200
			DURMN0	DIABETES DURATION (MONTHS) AT DCCT BASELINE	179.000
			ATT_AGE	ATTAINED AGE UP TO CT SCAN DATE (YEARS)	58.000
			DURN_YRS	DIABETES DURATION (YEARS)	33.083
			BMI	BODY MASS INDEX (KG/M2)	42.352
			WHRATIO	NATURAL WAIST TO HIP RATIO	1.024
			SBP	SYSTOLIC BLOOD PRESSURE (MM HG)	165.000
			DBP	DIASTOLIC BLOOD PRESSURE (MM HG)	98.000
			COMMYR6	COMMON CAROTID IMT YEAR 6	1.513
			COMINT6A	COMBINED CAROTID IMT YEAR 6	8.995
			tchol_mm		10.699
			hdl_mm		2.694
			ldl_mm		7.617
			LHRATIO	LDL/HDL RATIO	5.895
			trig_MM		5.503
			AER	AER (MG/24HR) AT VISIT PRIOR TO CT	2865.600
			HBAEL	HEMOGLOBIN A1C AT DCCT ELIGIBILITY	15.420
			DCCT_HBA	HEMOGLOBIN A1C MEAN DURING DCCT	11.143
			HBAM999	HEMOGLOBIN A1C AT DCCT CLOSE-OUT	11.100
			EDICMHBA	HEMOGLOBIN A1C MEAN DURING EDIC	11.950
			HBA1C	HEMOGLOBIN A1C AT VISIT PRIOR TO CT	14.500
			WTMHBA	HEMOGLOBIN A1C WEIGHTED MEAN DURING DCCT EDIC	10.907
	STANDARD	275	AGE0	AGE AT ENTRY INTO DCCT (YEARS)	39.000
			DCCT_FUY	DCCT FOLLOW-UP YEARS	9.550
			EDIC_FUY	EDIC FOLLOW-UP YEARS	10.108

The MEANS Procedure

SEX (F M)	TREATMENT GROUP	N Obs	Variable	Label	Maximum
F	STANDARD	275	AER0	AER (MG/24HR) AT DCCT BASELINE	87.840
			DURMN0	DIABETES DURATION (MONTHS) AT DCCT BASELINE	179.000
			ATT_AGE	ATTAINED AGE UP TO CT SCAN DATE (YEARS)	57.000
			DURN_YRS	DIABETES DURATION (YEARS)	33.417
			BMI	BODY MASS INDEX (KG/M2)	42.681
			WHRATIO	NATURAL WAIST TO HIP RATIO	0.971
			SBP	SYSTOLIC BLOOD PRESSURE (MM HG)	180.000
			DBP	DIASTOLIC BLOOD PRESSURE (MM HG)	110.000
			COMMYR6	COMMON CAROTID IMT YEAR 6	1.220
			COMINT6A	COMBINED CAROTID IMT YEAR 6	5.974
			tchol_mm		7.746
			hdl_mm		2.979
			ldl_mm		5.285
			LHRATIO	LDL/HDL RATIO	4.548
			trig_MM		5.175
			AER	AER (MG/24HR) AT VISIT PRIOR TO CT	4726.080
			HBAEL	HEMOGLOBIN A1C AT DCCT ELIGIBILITY	14.900
			DCCT_HBA	HEMOGLOBIN A1C MEAN DURING DCCT	13.575
			HBAM999	HEMOGLOBIN A1C AT DCCT CLOSE-OUT	13.900
			EDICMHBA	HEMOGLOBIN A1C MEAN DURING EDIC	12.711
			HBA1C	HEMOGLOBIN A1C AT VISIT PRIOR TO CT	14.300
			WTMHBA	HEMOGLOBIN A1C WEIGHTED MEAN DURING DCCT EDIC	12.456
M	EXPERIMENTAL	300	AGE0	AGE AT ENTRY INTO DCCT (YEARS)	39.000
			DCCT_FUY	DCCT FOLLOW-UP YEARS	9.448
			EDIC_FUY	EDIC FOLLOW-UP YEARS	10.125
			AER0	AER (MG/24HR) AT DCCT BASELINE	187.200
			DURMN0	DIABETES DURATION (MONTHS) AT DCCT BASELINE	180.000
			ATT_AGE	ATTAINED AGE UP TO CT SCAN DATE (YEARS)	58.000
			DURN_YRS	DIABETES DURATION (YEARS)	33.000
			BMI	BODY MASS INDEX (KG/M2)	48.809
			WHRATIO	NATURAL WAIST TO HIP RATIO	1.151
			SBP	SYSTOLIC BLOOD PRESSURE (MM HG)	187.000
			DBP	DIASTOLIC BLOOD PRESSURE (MM HG)	116.000
			COMMYR6	COMMON CAROTID IMT YEAR 6	0.980
			COMINT6A	COMBINED CAROTID IMT YEAR 6	8.682
			tchol_mm		8.135
			hdl_mm		3.109
			ldl_mm		5.751
			LHRATIO	LDL/HDL RATIO	6.059
			trig_MM		7.175
			AER	AER (MG/24HR) AT VISIT PRIOR TO CT	11057.760
			HBAEL	HEMOGLOBIN A1C AT DCCT ELIGIBILITY	14.090
			DCCT_HBA	HEMOGLOBIN A1C MEAN DURING DCCT	11.508
			HBAM999	HEMOGLOBIN A1C AT DCCT CLOSE-OUT	12.600
			EDICMHBA	HEMOGLOBIN A1C MEAN DURING EDIC	12.500

The MEANS Procedure

SEX (FM)	TREATMENT GROUP	N Obs	Variable	Label	Maximum
M	EXPERIMENTAL	300	HBA1C	HEMOGLOBIN A1C AT VISIT PRIOR TO CT	12.500
			WTMHBA	HEMOGLOBIN A1C WEIGHTED MEAN DURING DCCT EDIC	11.708
	STANDARD	333	AGE0	AGE AT ENTRY INTO DCCT (YEARS)	39.000
			DCCT_FUY	DCCT FOLLOW-UP YEARS	9.503
			EDIC_FUY	EDIC FOLLOW-UP YEARS	10.995
			AER0	AER (MG/24HR) AT DCCT BASELINE	286.560
			DURMN0	DIABETES DURATION (MONTHS) AT DCCT BASELINE	176.000
			ATT_AGE	ATTAINED AGE UP TO CT SCAN DATE (YEARS)	57.000
			DURN_YRS	DIABETES DURATION (YEARS)	33.667
			BMI	BODY MASS INDEX (KG/M2)	41.631
			WHRATIO	NATURAL WAIST TO HIP RATIO	1.118
			SBP	SYSTOLIC BLOOD PRESSURE (MM HG)	196.000
			DBP	DIASTOLIC BLOOD PRESSURE (MM HG)	119.000
			COMMYR6	COMMON CAROTID IMT YEAR 6	1.780
			COMINT6A	COMBINED CAROTID IMT YEAR 6	14.781
			tchol_mm		7.772
			hdl_mm		2.487
			ldl_mm		5.674
			LHRATIO	LDL/HDL RATIO	5.595
			trig_MM		3.853
			AER	AER (MG/24HR) AT VISIT PRIOR TO CT	7356.960
			HBAEL	HEMOGLOBIN A1C AT DCCT ELIGIBILITY	13.800
			DCCT_HBA	HEMOGLOBIN A1C MEAN DURING DCCT	12.462
			HBAM999	HEMOGLOBIN A1C AT DCCT CLOSE-OUT	14.000
			EDICMHBA	HEMOGLOBIN A1C MEAN DURING EDIC	12.170
			HBA1C	HEMOGLOBIN A1C AT VISIT PRIOR TO CT	13.300
			WTMHBA	HEMOGLOBIN A1C WEIGHTED MEAN DURING DCCT EDIC	12.293

---------- SEX (F M)=F ----------

The FREQ Procedure

Table of GROUP by RETBASE

GROUP(TREATMENT GROUP)
RETBASE(RETINATOPATHY AT DCCT BASELINE (PRIM,SCND))

Frequency / Percent / Row Pct / Col Pct	PRIM	SCND	Total
EXPERIMENTAL	152	145	297
	26.57	25.35	51.92
	51.18	48.82	
	53.15	50.70	
STANDARD	134	141	275
	23.43	24.65	48.08
	48.73	51.27	
	46.85	49.30	
Total	286	286	572
	50.00	50.00	100.00

Table of GROUP by SMOKING

GROUP(TREATMENT GROUP)
SMOKING(CURRENT SMOKER (0=NO 1=YES))

Frequency / Percent / Row Pct / Col Pct	0	1	Total
EXPERIMENTAL	253	44	297
	44.23	7.69	51.92
	85.19	14.81	
	51.32	55.70	
STANDARD	240	35	275
	41.96	6.12	48.08
	87.27	12.73	
	48.68	44.30	
Total	493	79	572
	86.19	13.81	100.00

---------- SEX (F M)=F ----------

The FREQ Procedure

Table of GROUP by AARLT09

GROUP(TREATMENT GROUP)
AARLT09(ANKLE ARM BLOOD PRESSURE RATIO < 0.9 (0=NO 1=YES))

Frequency Percent Row Pct Col Pct	0	1	Total
EXPERIMENTAL	254 44.72 85.52 51.52	43 7.57 14.48 57.33	297 52.29
STANDARD	239 42.08 88.19 48.48	32 5.63 11.81 42.67	271 47.71
Total	493 86.80	75 13.20	568 100.00

Frequency Missing = 4

Table of GROUP by HT

GROUP(TREATMENT GROUP)
HT(BP >=140/90 OR ANTIHYPERTENSIVES (0=NO 1=YES))

Frequency Percent Row Pct Col Pct	0	1	Total
EXPERIMENTAL	211 36.89 71.04 54.52	86 15.03 28.96 46.49	297 51.92
STANDARD	176 30.77 64.00 45.48	99 17.31 36.00 53.51	275 48.08
Total	387 67.66	185 32.34	572 100.00

---------- SEX (F M)=F ----------

The FREQ Procedure

Table of GROUP by ASPIRIN

GROUP(TREATMENT GROUP)
ASPIRIN(ASPIRIN (>= 14 TABLETS PER MONTH) (0=NO 1=YES))

Frequency Percent Row Pct Col Pct	0	1	Total
EXPERIMENTAL	233 40.73 78.45 52.95	64 11.19 21.55 48.48	297 51.92
STANDARD	207 36.19 75.27 47.05	68 11.89 24.73 51.52	275 48.08
Total	440 76.92	132 23.08	572 100.00

Table of GROUP by MENO

GROUP(TREATMENT GROUP)
MENO(MENOPAUSE (CEASED+PERM) (0=NO 1=YES))

Frequency Percent Row Pct Col Pct	0	1	Total
EXPERIMENTAL	217 38.41 73.56 50.35	78 13.81 26.44 58.21	295 52.21
STANDARD	214 37.88 79.26 49.65	56 9.91 20.74 41.79	270 47.79
Total	431 76.28	134 23.72	565 100.00

Frequency Missing = 7

---------- SEX (F M)=F ----------

The FREQ Procedure

Table of GROUP by PARTYII

GROUP(TREATMENT GROUP)
PARTYII(ONE OR BOTH PARENTS WITH TYPE II DIABETES (0=NO 1=YES))

Frequency Percent Row Pct Col Pct	0	1	Total
EXPERIMENTAL	238 41.61 80.13 50.32	59 10.31 19.87 59.60	297 51.92
STANDARD	235 41.08 85.45 49.68	40 6.99 14.55 40.40	275 48.08
Total	473 82.69	99 17.31	572 100.00

Table of GROUP by HLIP

GROUP(TREATMENT GROUP)
HLIP(LDL >=130 OR MEDICATION (0=NO 1=YES))

Frequency Percent Row Pct Col Pct	0	1	Total
EXPERIMENTAL	207 36.19 69.70 51.49	90 15.73 30.30 52.94	297 51.92
STANDARD	195 34.09 70.91 48.51	80 13.99 29.09 47.06	275 48.08
Total	402 70.28	170 29.72	572 100.00

---------- SEX (F M)=F ----------

The FREQ Procedure

Table of GROUP by AER40

GROUP(TREATMENT GROUP)

	AER40(AER >40 AT VISIT PRIOR TO CT (0=NO 1=YES))		
Frequency / Percent / Row Pct / Col Pct	0	1	Total
EXPERIMENTAL	271	26	297
	47.38	4.55	51.92
	91.25	8.75	
	54.64	34.21	
STANDARD	225	50	275
	39.34	8.74	48.08
	81.82	18.18	
	45.36	65.79	
Total	496	76	572
	86.71	13.29	100.00

---------- SEX (F M)=M ----------

The FREQ Procedure

Table of GROUP by RETBASE

GROUP(TREATMENT GROUP)
RETBASE(RETINATOPATHY AT DCCT BASELINE (PRIM,SCND))

Frequency / Percent / Row Pct / Col Pct	PRIM	SCND	Total
EXPERIMENTAL	139	161	300
	21.96	25.43	47.39
	46.33	53.67	
	43.85	50.95	
STANDARD	178	155	333
	28.12	24.49	52.61
	53.45	46.55	
	56.15	49.05	
Total	317	316	633
	50.08	49.92	100.00

Table of GROUP by SMOKING

GROUP(TREATMENT GROUP)
SMOKING(CURRENT SMOKER (0=NO 1=YES))

Frequency / Percent / Row Pct / Col Pct	0	1	Total
EXPERIMENTAL	248	52	300
	39.18	8.21	47.39
	82.67	17.33	
	46.53	52.00	
STANDARD	285	48	333
	45.02	7.58	52.61
	85.59	14.41	
	53.47	48.00	
Total	533	100	633
	84.20	15.80	100.00

---------- SEX (F M)=M ----------

The FREQ Procedure

Table of GROUP by AARLT09

GROUP(TREATMENT GROUP)
AARLT09(ANKLE ARM BLOOD PRESSURE RATIO < 0.9 (0=NO 1=YES))

Frequency Percent Row Pct Col Pct	0	1	Total
EXPERIMENTAL	277 43.90 92.64 47.51	22 3.49 7.36 45.83	299 47.39
STANDARD	306 48.49 92.17 52.49	26 4.12 7.83 54.17	332 52.61
Total	583 92.39	48 7.61	631 100.00

Frequency Missing = 2

Table of GROUP by HT

GROUP(TREATMENT GROUP)
HT(BP >=140/90 OR ANTIHYPERTENSIVES (0=NO 1=YES))

Frequency Percent Row Pct Col Pct	0	1	Total
EXPERIMENTAL	193 30.49 64.33 51.88	107 16.90 35.67 41.00	300 47.39
STANDARD	179 28.28 53.75 48.12	154 24.33 46.25 59.00	333 52.61
Total	372 58.77	261 41.23	633 100.00

---------- SEX (F M)=M ----------

The FREQ Procedure

Table of GROUP by ASPIRIN

GROUP(TREATMENT GROUP)
ASPIRIN(ASPIRIN (>= 14 TABLETS PER MONTH) (0=NO 1=YES))

Frequency Percent Row Pct Col Pct	0	1	Total
EXPERIMENTAL	222 35.07 74.00 50.00	78 12.32 26.00 41.27	300 47.39
STANDARD	222 35.07 66.67 50.00	111 17.54 33.33 58.73	333 52.61
Total	444 70.14	189 29.86	633 100.00

For GROUP * MENO
all data are missing since all
the levels of variable MENO are missing.

---------- SEX (F M)=M ----------

The FREQ Procedure

Table of GROUP by PARTYII

GROUP(TREATMENT GROUP)
PARTYII(ONE OR BOTH PARENTS WITH TYPE II DIABETES (0=NO 1=YES))

Frequency / Percent / Row Pct / Col Pct	0	1	Total
EXPERIMENTAL	248	52	300
	39.18	8.21	47.39
	82.67	17.33	
	47.97	44.83	
STANDARD	269	64	333
	42.50	10.11	52.61
	80.78	19.22	
	52.03	55.17	
Total	517	116	633
	81.67	18.33	100.00

Table of GROUP by HLIP

GROUP(TREATMENT GROUP)
HLIP(LDL >=130 OR MEDICATION (0=NO 1=YES))

Frequency / Percent / Row Pct / Col Pct	0	1	Total
EXPERIMENTAL	168	132	300
	26.54	20.85	47.39
	56.00	44.00	
	45.53	50.00	
STANDARD	201	132	333
	31.75	20.85	52.61
	60.36	39.64	
	54.47	50.00	
Total	369	264	633
	58.29	41.71	100.00

---------- SEX (F M)=M ----------

The FREQ Procedure

Table of GROUP by AER40

GROUP(TREATMENT GROUP)

	AER40(AER >40 AT VISIT PRIOR TO CT (0=NO 1=YES))		
Frequency / Percent / Row Pct / Col Pct	0	1	Total
EXPERIMENTAL	262	38	300
	41.39	6.00	47.39
	87.33	12.67	
	51.37	30.89	
STANDARD	248	85	333
	39.18	13.43	52.61
	74.47	25.53	
	48.63	69.11	
Total	510	123	633
	80.57	19.43	100.00

The CORR Procedure

1 Partial Variables: male
1 With Variables: ATT_AGE
3 Variables: CTGT0 CTGT200 LOGCT

Simple Statistics

Variable	N	Mean	Std Dev	Median	Minimum	Maximum
male	1205	0.52531	0.49957	1.00000	0	1.00000
ATT_AGE	1205	42.92697	6.85793	43.00000	26.00000	58.00000
CTGT0	1205	0.31037	0.46284	0	0	1.00000
CTGT200	1205	0.08465	0.27847	0	0	1.00000
LOGCT	1205	1.27255	2.14733	0	0	8.12297

Simple Statistics

Variable	Partial Variance	Partial Std Dev	Label
male			
ATT_AGE	46.92620	6.85027	ATTAINED AGE UP TO CT SCAN DATE (YEARS)
CTGT0	0.20426	0.45195	CAC CALCIUM DEPOSIT > 0 (0=NO 1=YES)
CTGT200	0.07646	0.27651	CAC CALCIUM DEPOSIT > 200 (0=NO 1=YES)
LOGCT	4.40714	2.09932	LOG CAC FOR TOBIT MODEL

Pearson Partial Correlation Coefficients, N = 1205
Prob > |r| under H0: Partial Rho=0

	CTGT0	CTGT200	LOGCT
ATT_AGE	0.31530	0.24661	0.33157
ATTAINED AGE UP TO CT SCAN DATE (YEARS)	<.0001	<.0001	<.0001

Spearman Partial Correlation Coefficients, N = 1205
Prob > |r| under H0: Partial Rho=0

	CTGT0	CTGT200	LOGCT
ATT_AGE	0.31926	0.24844	0.33677
ATTAINED AGE UP TO CT SCAN DATE (YEARS)	<.0001	<.0001	<.0001

The CORR Procedure

1 Partial Variables: AGE0
1 With Variables: male
3 Variables: CTGT0 CTGT200 LOGCT

Simple Statistics

Variable	N	Mean	Std Dev	Median	Minimum	Maximum
AGE0	1205	27.20664	6.91630	27.00000	13.00000	39.00000
male	1205	0.52531	0.49957	1.00000	0	1.00000
CTGT0	1205	0.31037	0.46284	0	0	1.00000
CTGT200	1205	0.08465	0.27847	0	0	1.00000
LOGCT	1205	1.27255	2.14733	0	0	8.12297

Simple Statistics

Variable	Partial Variance	Partial Std Dev	Label
AGE0			AGE AT ENTRY INTO DCCT (YEARS)
male	0.24894	0.49894	
CTGT0	0.19760	0.44453	CAC CALCIUM DEPOSIT > 0 (0=NO 1=YES)
CTGT200	0.07393	0.27190	CAC CALCIUM DEPOSIT > 200 (0=NO 1=YES)
LOGCT	4.22076	2.05445	LOG CAC FOR TOBIT MODEL

Pearson Partial Correlation Coefficients, N = 1205
Prob > |r| under H0: Partial Rho=0

	CTGT0	CTGT200	LOGCT
male	0.21001	0.11221	0.20454
	<.0001	<.0001	<.0001

Spearman Partial Correlation Coefficients, N = 1205
Prob > |r| under H0: Partial Rho=0

	CTGT0	CTGT200	LOGCT
male	0.20914	0.11128	0.21226
	<.0001	0.0001	<.0001

The CORR Procedure

1 Partial Variables: male
1 With Variables: AGE0
3 Variables: CTGT0 CTGT200 LOGCT

Simple Statistics

Variable	N	Mean	Std Dev	Median	Minimum	Maximum
male	1205	0.52531	0.49957	1.00000	0	1.00000
AGE0	1205	27.20664	6.91630	27.00000	13.00000	39.00000
CTGT0	1205	0.31037	0.46284	0	0	1.00000
CTGT200	1205	0.08465	0.27847	0	0	1.00000
LOGCT	1205	1.27255	2.14733	0	0	8.12297

Simple Statistics

Variable	Partial Variance	Partial Std Dev	Label
male			
AGE0	47.71533	6.90763	AGE AT ENTRY INTO DCCT (YEARS)
CTGT0	0.20426	0.45195	CAC CALCIUM DEPOSIT > 0 (0=NO 1=YES)
CTGT200	0.07646	0.27651	CAC CALCIUM DEPOSIT > 200 (0=NO 1=YES)
LOGCT	4.40714	2.09932	LOG CAC FOR TOBIT MODEL

Pearson Partial Correlation Coefficients, N = 1205
Prob > |r| under H0: Partial Rho=0

	CTGT0	CTGT200	LOGCT
AGE0	0.27434	0.21264	0.28698
AGE AT ENTRY INTO DCCT (YEARS)	<.0001	<.0001	<.0001

Spearman Partial Correlation Coefficients, N = 1205
Prob > |r| under H0: Partial Rho=0

	CTGT0	CTGT200	LOGCT
AGE0	0.28040	0.21901	0.29558
AGE AT ENTRY INTO DCCT (YEARS)	<.0001	<.0001	<.0001

The CORR Procedure

2 Partial Variables: AGE0 male
6 With Variables: SMOKING retprim AER0 DURMN0 DCCT_FUY EDIC_FUY
3 Variables: CTGT0 CTGT200 LOGCT

Simple Statistics

Variable	N	Mean	Std Dev	Median	Minimum	Maximum
AGE0	1205	27.20664	6.91630	27.00000	13.00000	39.00000
male	1205	0.52531	0.49957	1.00000	0	1.00000
SMOKING	1205	0.14855	0.35579	0	0	1.00000
retprim	1205	0.50041	0.50021	1.00000	0	1.00000
AER0	1205	15.75993	18.88202	11.52000	1.44000	286.56000
DURMN0	1205	67.32116	49.56680	50.00000	8.00000	180.00000
DCCT_FUY	1205	6.27614	1.68195	5.97673	2.54346	9.54962
EDIC_FUY	1205	9.15148	0.49477	9.22656	7.83573	10.99521
CTGT0	1205	0.31037	0.46284	0	0	1.00000
CTGT200	1205	0.08465	0.27847	0	0	1.00000
LOGCT	1205	1.27255	2.14733	0	0	8.12297

Simple Statistics

Variable	Partial Variance	Partial Std Dev	Label
AGE0			AGE AT ENTRY INTO DCCT (YEARS)
male			
SMOKING	0.12669	0.35594	CURRENT SMOKER (0=NO 1=YES)
retprim	0.25021	0.50021	
AER0	352.25487	18.76845	AER (MG/24HR) AT DCCT BASELINE
DURMN0	2451	49.51040	DIABETES DURATION (MONTHS) AT DCCT BASELINE
DCCT_FUY	2.74198	1.65589	DCCT FOLLOW-UP YEARS
EDIC_FUY	0.24515	0.49513	EDIC FOLLOW-UP YEARS
CTGT0	0.18904	0.43479	CAC CALCIUM DEPOSIT > 0 (0=NO 1=YES)
CTGT200	0.07306	0.27030	CAC CALCIUM DEPOSIT > 200 (0=NO 1=YES)
LOGCT	4.04755	2.01185	LOG CAC FOR TOBIT MODEL

The CORR Procedure

Pearson Partial Correlation Coefficients, N = 1205
Prob > |r| under H0: Partial Rho=0

	CTGT0	CTGT200	LOGCT
SMOKING	0.13222	0.12634	0.13794
CURRENT SMOKER (0=NO 1=YES)	<.0001	<.0001	<.0001
retprim	-0.10777	-0.08382	-0.12110
	0.0002	0.0036	<.0001
AER0	0.11482	0.06704	0.12317
AER (MG/24HR) AT DCCT BASELINE	<.0001	0.0201	<.0001
DURMN0	0.10967	0.08261	0.12320
DIABETES DURATION (MONTHS) AT DCCT BASELINE	0.0001	0.0041	<.0001
DCCT_FUY	0.20485	0.15708	0.21439
DCCT FOLLOW-UP YEARS	<.0001	<.0001	<.0001
EDIC_FUY	0.01725	0.03464	0.05052
EDIC FOLLOW-UP YEARS	0.5500	0.2300	0.0798

Spearman Partial Correlation Coefficients, N = 1205
Prob > |r| under H0: Partial Rho=0

	CTGT0	CTGT200	LOGCT
SMOKING	0.12952	0.12428	0.13642
CURRENT SMOKER (0=NO 1=YES)	<.0001	<.0001	<.0001
retprim	-0.11174	-0.08677	-0.12208
	0.0001	0.0026	<.0001
AER0	0.08519	0.07217	0.09302
AER (MG/24HR) AT DCCT BASELINE	0.0031	0.0123	0.0012
DURMN0	0.10805	0.07779	0.11810
DIABETES DURATION (MONTHS) AT DCCT BASELINE	0.0002	0.0069	<.0001
DCCT_FUY	0.19243	0.14373	0.20295
DCCT FOLLOW-UP YEARS	<.0001	<.0001	<.0001
EDIC_FUY	0.01140	0.03101	0.02521
EDIC FOLLOW-UP YEARS	0.6927	0.2824	0.3822

The CORR Procedure

2 Partial Variables: AGE0 male
1 With Variables: DURN_YRS
3 Variables: CTGT0 CTGT200 LOGCT

Simple Statistics

Variable	N	Mean	Std Dev	Median	Minimum	Maximum
AGE0	1205	27.20664	6.91630	27.00000	13.00000	39.00000
male	1205	0.52531	0.49957	1.00000	0	1.00000
DURN_YRS	1205	21.03893	4.88441	19.91667	13.25000	33.66667
CTGT0	1205	0.31037	0.46284	0	0	1.00000
CTGT200	1205	0.08465	0.27847	0	0	1.00000
LOGCT	1205	1.27255	2.14733	0	0	8.12297

Simple Statistics

Variable	Label
AGE0	AGE AT ENTRY INTO DCCT (YEARS)
male	
DURN_YRS	DIABETES DURATION (YEARS)
CTGT0	CAC CALCIUM DEPOSIT > 0 (0=NO 1=YES)
CTGT200	CAC CALCIUM DEPOSIT > 200 (0=NO 1=YES)
LOGCT	LOG CAC FOR TOBIT MODEL

Spearman Partial Correlation Coefficients, N = 1205
Prob > |r| under H0: Partial Rho=0

	CTGT0	CTGT200	LOGCT
DURN_YRS	0.15889	0.12539	0.17330
DIABETES DURATION (YEARS)	<.0001	<.0001	<.0001

The CORR Procedure

2 Partial Variables: AGE0 male
1 With Variables: WEIGHT
3 Variables: CTGT0 CTGT200 LOGCT

Simple Statistics

Variable	N	Mean	Std Dev	Median	Minimum	Maximum
AGE0	1199	27.20767	6.92804	27.00000	13.00000	39.00000
male	1199	0.52627	0.49952	1.00000	0	1.00000
WEIGHT	1199	82.12609	16.54279	81.00000	44.25000	173.10000
CTGT0	1199	0.30942	0.46245	0	0	1.00000
CTGT200	1199	0.08507	0.27910	0	0	1.00000
LOGCT	1199	1.27079	2.14797	0	0	8.12297

Simple Statistics

Variable	Label
AGE0	AGE AT ENTRY INTO DCCT (YEARS)
male	
WEIGHT	WEIGHT (KG)
CTGT0	CAC CALCIUM DEPOSIT > 0 (0=NO 1=YES)
CTGT200	CAC CALCIUM DEPOSIT > 200 (0=NO 1=YES)
LOGCT	LOG CAC FOR TOBIT MODEL

Spearman Partial Correlation Coefficients, N = 1199
Prob > |r| under H0: Partial Rho=0

	CTGT0	CTGT200	LOGCT
WEIGHT	0.01899	-0.02314	0.00932
WEIGHT (KG)	0.5116	0.4239	0.7474

The CORR Procedure

2 Partial Variables: AGE0 male
1 With Variables: HEIGHT
3 Variables: CTGT0 CTGT200 LOGCT

Simple Statistics

Variable	N	Mean	Std Dev	Median	Minimum	Maximum
AGE0	1193	27.17770	6.92180	27.00000	13.00000	39.00000
male	1193	0.52724	0.49947	1.00000	0	1.00000
HEIGHT	1193	172.21127	9.52191	172.00000	142.15000	201.30000
CTGT0	1193	0.30930	0.46240	0	0	1.00000
CTGT200	1193	0.08466	0.27849	0	0	1.00000
LOGCT	1193	1.26757	2.14210	0	0	8.02890

Simple Statistics

Variable	Label
AGE0	AGE AT ENTRY INTO DCCT (YEARS)
male	
HEIGHT	HEIGHT (CM)
CTGT0	CAC CALCIUM DEPOSIT > 0 (0=NO 1=YES)
CTGT200	CAC CALCIUM DEPOSIT > 200 (0=NO 1=YES)
LOGCT	LOG CAC FOR TOBIT MODEL

Spearman Partial Correlation Coefficients, N = 1193
Prob > |r| under H0: Partial Rho=0

	CTGT0	CTGT200	LOGCT
HEIGHT	-0.03842	-0.08156	-0.05687
HEIGHT (CM)	0.1851	0.0049	0.0497

The CORR Procedure

2 Partial Variables: AGE0 male
1 With Variables: BMI
3 Variables: CTGT0 CTGT200 LOGCT

Simple Statistics

Variable	N	Mean	Std Dev	Median	Minimum	Maximum
AGE0	1192	27.18372	6.92158	27.00000	13.00000	39.00000
male	1192	0.52768	0.49944	1.00000	0	1.00000
BMI	1192	27.52062	4.37447	27.01912	17.59805	48.80928
CTGT0	1192	0.30956	0.46251	0	0	1.00000
CTGT200	1192	0.08473	0.27860	0	0	1.00000
LOGCT	1192	1.26863	2.14269	0	0	8.02890

Simple Statistics

Variable	Label
AGE0	AGE AT ENTRY INTO DCCT (YEARS)
male	
BMI	BODY MASS INDEX (KG/M2)
CTGT0	CAC CALCIUM DEPOSIT > 0 (0=NO 1=YES)
CTGT200	CAC CALCIUM DEPOSIT > 200 (0=NO 1=YES)
LOGCT	LOG CAC FOR TOBIT MODEL

Spearman Partial Correlation Coefficients, N = 1192
Prob > |r| under H0: Partial Rho=0

	CTGT0	CTGT200	LOGCT
BMI	0.03446	0.01876	0.03607
BODY MASS INDEX (KG/M2)	0.2348	0.5179	0.2138

The CORR Procedure

2 Partial Variables: AGE0 male
1 With Variables: WHRATIO
3 Variables: CTGT0 CTGT200 LOGCT

Simple Statistics

Variable	N	Mean	Std Dev	Median	Minimum	Maximum
AGE0	1189	27.18419	6.92958	27.00000	13.00000	39.00000
male	1189	0.52649	0.49951	1.00000	0	1.00000
WHRATIO	1189	0.84759	0.08574	0.84653	0.61664	1.15142
CTGT0	1189	0.30950	0.46248	0	0	1.00000
CTGT200	1189	0.08410	0.27766	0	0	1.00000
LOGCT	1189	1.26637	2.13911	0	0	8.02890

Simple Statistics

Variable	Label
AGE0	AGE AT ENTRY INTO DCCT (YEARS)
male	
WHRATIO	NATURAL WAIST TO HIP RATIO
CTGT0	CAC CALCIUM DEPOSIT > 0 (0=NO 1=YES)
CTGT200	CAC CALCIUM DEPOSIT > 200 (0=NO 1=YES)
LOGCT	LOG CAC FOR TOBIT MODEL

Spearman Partial Correlation Coefficients, N = 1189
Prob > |r| under H0: Partial Rho=0

	CTGT0	CTGT200	LOGCT
WHRATIO	0.13726	0.07910	0.13848
NATURAL WAIST TO HIP RATIO	<.0001	0.0064	<.0001

The CORR Procedure

2 Partial Variables: AGE0 male
1 With Variables: AARATIO
3 Variables: CTGT0 CTGT200 LOGCT

Simple Statistics

Variable	N	Mean	Std Dev	Median	Minimum	Maximum
AGE0	1199	27.20267	6.92783	27.00000	13.00000	39.00000
male	1199	0.52627	0.49952	1.00000	0	1.00000
AARATIO	1199	1.05167	0.13898	1.05263	0.00826	1.63380
CTGT0	1199	0.31026	0.46279	0	0	1.00000
CTGT200	1199	0.08507	0.27910	0	0	1.00000
LOGCT	1199	1.27325	2.14821	0	0	8.12297

Simple Statistics

Variable	Label
AGE0	AGE AT ENTRY INTO DCCT (YEARS)
male	
AARATIO	ANKLE TO ARM BLOOD PRESSURE RATIO (MM HG)
CTGT0	CAC CALCIUM DEPOSIT > 0 (0=NO 1=YES)
CTGT200	CAC CALCIUM DEPOSIT > 200 (0=NO 1=YES)
LOGCT	LOG CAC FOR TOBIT MODEL

Spearman Partial Correlation Coefficients, N = 1199
Prob > |r| under H0: Partial Rho=0

	CTGT0	CTGT200	LOGCT
AARATIO	-0.04440	-0.09057	-0.06543
ANKLE TO ARM BLOOD PRESSURE RATIO (MM HG)	0.1247	0.0017	0.0236

The CORR Procedure

2 Partial Variables: AGE0 male
1 With Variables: hdl_mm
3 Variables: CTGT0 CTGT200 LOGCT

Simple Statistics

Variable	N	Mean	Std Dev	Median	Minimum	Maximum
AGE0	1204	27.20764	6.91908	27.00000	13.00000	39.00000
male	1204	0.52492	0.49959	1.00000	0	1.00000
hdl_mm	1204	1.45342	0.38213	1.39896	0.49223	3.10881
CTGT0	1204	0.30980	0.46260	0	0	1.00000
CTGT200	1204	0.08472	0.27858	0	0	1.00000
LOGCT	1204	1.27241	2.14822	0	0	8.12297

Simple Statistics

Variable	Label
AGE0	AGE AT ENTRY INTO DCCT (YEARS)
male	
hdl_mm	
CTGT0	CAC CALCIUM DEPOSIT > 0 (0=NO 1=YES)
CTGT200	CAC CALCIUM DEPOSIT > 200 (0=NO 1=YES)
LOGCT	LOG CAC FOR TOBIT MODEL

Spearman Partial Correlation Coefficients, N = 1204
Prob > |r| under H0: Partial Rho=0

	CTGT0	CTGT200	LOGCT
hdl_mm	-0.09548	-0.05509	-0.09536
	0.0009	0.0562	0.0009

The CORR Procedure

2 Partial Variables: AGE0 male
1 With Variables: ldl_mm
3 Variables: CTGT0 CTGT200 LOGCT

Simple Statistics

Variable	N	Mean	Std Dev	Median	Minimum	Maximum
AGE0	1196	27.22910	6.90820	27.00000	13.00000	39.00000
male	1196	0.52592	0.49954	1.00000	0	1.00000
ldl_mm	1196	2.90357	0.74196	2.84974	0.93264	7.61658
CTGT0	1196	0.30853	0.46208	0	0	1.00000
CTGT200	1196	0.08445	0.27818	0	0	1.00000
LOGCT	1196	1.26654	2.14525	0	0	8.12297

Simple Statistics

Variable	Label
AGE0	AGE AT ENTRY INTO DCCT (YEARS)
male	
ldl_mm	
CTGT0	CAC CALCIUM DEPOSIT > 0 (0=NO 1=YES)
CTGT200	CAC CALCIUM DEPOSIT > 200 (0=NO 1=YES)
LOGCT	LOG CAC FOR TOBIT MODEL

Spearman Partial Correlation Coefficients, N = 1196
Prob > |r| under H0: Partial Rho=0

	CTGT0	CTGT200	LOGCT
ldl_mm	0.01798	0.00767	0.01774
	0.5348	0.7912	0.5402

The CORR Procedure

2 Partial Variables: AGE0 male
1 With Variables: tchol_mm
3 Variables: CTGT0 CTGT200 LOGCT

Simple Statistics

Variable	N	Mean	Std Dev	Median	Minimum	Maximum
AGE0	1204	27.20764	6.91908	27.00000	13.00000	39.00000
male	1204	0.52492	0.49959	1.00000	0	1.00000
tchol_mm	1204	4.82668	0.88952	4.76684	2.15026	10.69948
CTGT0	1204	0.30980	0.46260	0	0	1.00000
CTGT200	1204	0.08472	0.27858	0	0	1.00000
LOGCT	1204	1.27241	2.14822	0	0	8.12297

Simple Statistics

Variable	Label
AGE0	AGE AT ENTRY INTO DCCT (YEARS)
male	
tchol_mm	
CTGT0	CAC CALCIUM DEPOSIT > 0 (0=NO 1=YES)
CTGT200	CAC CALCIUM DEPOSIT > 200 (0=NO 1=YES)
LOGCT	LOG CAC FOR TOBIT MODEL

Spearman Partial Correlation Coefficients, N = 1204
Prob > |r| under H0: Partial Rho=0

	CTGT0	CTGT200	LOGCT
tchol_mm	0.00068	0.01401	0.00378
	0.9813	0.6274	0.8958

The CORR Procedure

2 Partial Variables: AGE0 male
1 With Variables: LHRATIO
3 Variables: CTGT0 CTGT200 LOGCT

Simple Statistics

Variable	N	Mean	Std Dev	Median	Minimum	Maximum
AGE0	1196	27.22910	6.90820	27.00000	13.00000	39.00000
male	1196	0.52592	0.49954	1.00000	0	1.00000
LHRATIO	1196	2.14434	0.82300	2.01906	0.48235	6.05882
CTGT0	1196	0.30853	0.46208	0	0	1.00000
CTGT200	1196	0.08445	0.27818	0	0	1.00000
LOGCT	1196	1.26654	2.14525	0	0	8.12297

Simple Statistics

Variable	Label
AGE0	AGE AT ENTRY INTO DCCT (YEARS)
male	
LHRATIO	LDL/HDL RATIO
CTGT0	CAC CALCIUM DEPOSIT > 0 (0=NO 1=YES)
CTGT200	CAC CALCIUM DEPOSIT > 200 (0=NO 1=YES)
LOGCT	LOG CAC FOR TOBIT MODEL

Spearman Partial Correlation Coefficients, N = 1196
Prob > |r| under H0: Partial Rho=0

	CTGT0	CTGT200	LOGCT
LHRATIO	0.07790	0.02956	0.07395
LDL/HDL RATIO	0.0071	0.3074	0.0106

The CORR Procedure

2 Partial Variables: AGE0 male
1 With Variables: trig_MM
3 Variables: CTGT0 CTGT200 LOGCT

Simple Statistics

Variable	N	Mean	Std Dev	Median	Minimum	Maximum
AGE0	1204	27.20764	6.91908	27.00000	13.00000	39.00000
male	1204	0.52492	0.49959	1.00000	0	1.00000
trig_MM	1204	1.01784	0.69331	0.82486	0.22599	7.17514
CTGT0	1204	0.30980	0.46260	0	0	1.00000
CTGT200	1204	0.08472	0.27858	0	0	1.00000
LOGCT	1204	1.27241	2.14822	0	0	8.12297

Simple Statistics

Variable	Label
AGE0	AGE AT ENTRY INTO DCCT (YEARS)
male	
trig_MM	
CTGT0	CAC CALCIUM DEPOSIT > 0 (0=NO 1=YES)
CTGT200	CAC CALCIUM DEPOSIT > 200 (0=NO 1=YES)
LOGCT	LOG CAC FOR TOBIT MODEL

Spearman Partial Correlation Coefficients, N = 1204
Prob > |r| under H0: Partial Rho=0

	CTGT0	CTGT200	LOGCT
trig_MM	0.07004	0.07197	0.08046
	0.0152	0.0126	0.0052

The CORR Procedure

2 Partial Variables: AGE0 male
1 With Variables: HLIP
3 Variables: CTGT0 CTGT200 LOGCT

Simple Statistics

Variable	N	Mean	Std Dev	Median	Minimum	Maximum
AGE0	1205	27.20664	6.91630	27.00000	13.00000	39.00000
male	1205	0.52531	0.49957	1.00000	0	1.00000
HLIP	1205	0.36017	0.48025	0	0	1.00000
CTGT0	1205	0.31037	0.46284	0	0	1.00000
CTGT200	1205	0.08465	0.27847	0	0	1.00000
LOGCT	1205	1.27255	2.14733	0	0	8.12297

Simple Statistics

Variable	Label
AGE0	AGE AT ENTRY INTO DCCT (YEARS)
male	
HLIP	LDL >=130 OR MEDICATION (0=NO 1=YES)
CTGT0	CAC CALCIUM DEPOSIT > 0 (0=NO 1=YES)
CTGT200	CAC CALCIUM DEPOSIT > 200 (0=NO 1=YES)
LOGCT	LOG CAC FOR TOBIT MODEL

Spearman Partial Correlation Coefficients, N = 1205
Prob > |r| under H0: Partial Rho=0

	CTGT0	CTGT200	LOGCT
HLIP	0.12836	0.11371	0.14151
LDL >=130 OR MEDICATION (0=NO 1=YES)	<.0001	<.0001	<.0001

The CORR Procedure

2 Partial Variables: AGE0 male
1 With Variables: SBP
3 Variables: CTGT0 CTGT200 LOGCT

Simple Statistics

Variable	N	Mean	Std Dev	Median	Minimum	Maximum
AGE0	1202	27.20799	6.92436	27.00000	13.00000	39.00000
male	1202	0.52579	0.49954	1.00000	0	1.00000
SBP	1202	122.17221	14.33518	121.00000	76.00000	196.00000
CTGT0	1202	0.31032	0.46282	0	0	1.00000
CTGT200	1202	0.08486	0.27879	0	0	1.00000
LOGCT	1202	1.27452	2.14938	0	0	8.12297

Simple Statistics

Variable	Label
AGE0	AGE AT ENTRY INTO DCCT (YEARS)
male	
SBP	SYSTOLIC BLOOD PRESSURE (MM HG)
CTGT0	CAC CALCIUM DEPOSIT > 0 (0=NO 1=YES)
CTGT200	CAC CALCIUM DEPOSIT > 200 (0=NO 1=YES)
LOGCT	LOG CAC FOR TOBIT MODEL

Spearman Partial Correlation Coefficients, N = 1202
Prob > |r| under H0: Partial Rho=0

	CTGT0	CTGT200	LOGCT
SBP	0.05966	0.06759	0.06730
SYSTOLIC BLOOD PRESSURE (MM HG)	0.0388	0.0192	0.0197

The CORR Procedure

2 Partial Variables: AGE0 male
1 With Variables: DBP
3 Variables: CTGT0 CTGT200 LOGCT

Simple Statistics

Variable	N	Mean	Std Dev	Median	Minimum	Maximum
AGE0	1202	27.20799	6.92436	27.00000	13.00000	39.00000
male	1202	0.52579	0.49954	1.00000	0	1.00000
DBP	1202	76.41223	9.31297	77.00000	41.00000	119.00000
CTGT0	1202	0.31032	0.46282	0	0	1.00000
CTGT200	1202	0.08486	0.27879	0	0	1.00000
LOGCT	1202	1.27452	2.14938	0	0	8.12297

Simple Statistics

Variable	Label
AGE0	AGE AT ENTRY INTO DCCT (YEARS)
male	
DBP	DIASTOLIC BLOOD PRESSURE (MM HG)
CTGT0	CAC CALCIUM DEPOSIT > 0 (0=NO 1=YES)
CTGT200	CAC CALCIUM DEPOSIT > 200 (0=NO 1=YES)
LOGCT	LOG CAC FOR TOBIT MODEL

Spearman Partial Correlation Coefficients, N = 1202
Prob > |r| under H0: Partial Rho=0

	CTGT0	CTGT200	LOGCT
DBP	-0.03052	0.01935	-0.02428
DIASTOLIC BLOOD PRESSURE (MM HG)	0.2908	0.5030	0.4008

The CORR Procedure

2 Partial Variables: AGE0 male
1 With Variables: HT
3 Variables: CTGT0 CTGT200 LOGCT

Simple Statistics

Variable	N	Mean	Std Dev	Median	Minimum	Maximum
AGE0	1205	27.20664	6.91630	27.00000	13.00000	39.00000
male	1205	0.52531	0.49957	1.00000	0	1.00000
HT	1205	0.37012	0.48304	0	0	1.00000
CTGT0	1205	0.31037	0.46284	0	0	1.00000
CTGT200	1205	0.08465	0.27847	0	0	1.00000
LOGCT	1205	1.27255	2.14733	0	0	8.12297

Simple Statistics

Variable	Label
AGE0	AGE AT ENTRY INTO DCCT (YEARS)
male	
HT	BP >=140/90 OR ANTIHYPERTENSIVES (0=NO 1=YES)
CTGT0	CAC CALCIUM DEPOSIT > 0 (0=NO 1=YES)
CTGT200	CAC CALCIUM DEPOSIT > 200 (0=NO 1=YES)
LOGCT	LOG CAC FOR TOBIT MODEL

Spearman Partial Correlation Coefficients, N = 1205
Prob > |r| under H0: Partial Rho=0

	CTGT0	CTGT200	LOGCT
HT	0.12043	0.11724	0.14544
BP >=140/90 OR ANTIHYPERTENSIVES (0=NO 1=YES)	<.0001	<.0001	<.0001

The CORR Procedure

2 Partial Variables: AGE0 male
1 With Variables: AER40
3 Variables: CTGT0 CTGT200 LOGCT

Simple Statistics

Variable	N	Mean	Std Dev	Median	Minimum	Maximum
AGE0	1205	27.20664	6.91630	27.00000	13.00000	39.00000
male	1205	0.52531	0.49957	1.00000	0	1.00000
AER40	1205	0.16515	0.37147	0	0	1.00000
CTGT0	1205	0.31037	0.46284	0	0	1.00000
CTGT200	1205	0.08465	0.27847	0	0	1.00000
LOGCT	1205	1.27255	2.14733	0	0	8.12297

Simple Statistics

Variable	Label
AGE0	AGE AT ENTRY INTO DCCT (YEARS)
male	
AER40	AER >40 AT VISIT PRIOR TO CT (0=NO 1=YES)
CTGT0	CAC CALCIUM DEPOSIT > 0 (0=NO 1=YES)
CTGT200	CAC CALCIUM DEPOSIT > 200 (0=NO 1=YES)
LOGCT	LOG CAC FOR TOBIT MODEL

Spearman Partial Correlation Coefficients, N = 1205
Prob > |r| under H0: Partial Rho=0

	CTGT0	CTGT200	LOGCT
AER40	0.08558	0.11973	0.11023
AER >40 AT VISIT PRIOR TO CT (0=NO 1=YES)	0.0030	<.0001	0.0001

The CORR Procedure

2 Partial Variables: AGE0 male
1 With Variables: COMINT6A
3 Variables: CTGT0 CTGT200 LOGCT

Simple Statistics

Variable	N	Mean	Std Dev	Median	Minimum	Maximum
AGE0	1103	27.24841	6.87059	28.00000	13.00000	39.00000
male	1103	0.52493	0.49960	1.00000	0	1.00000
COMINT6A	1103	0.04261	1.67423	-0.35349	-3.06444	14.78076
CTGT0	1103	0.31097	0.46310	0	0	1.00000
CTGT200	1103	0.07978	0.27108	0	0	1.00000
LOGCT	1103	1.24932	2.11552	0	0	8.12297

Simple Statistics

Variable	Label
AGE0	AGE AT ENTRY INTO DCCT (YEARS)
male	
COMINT6A	COMBINED CAROTID IMT YEAR 6
CTGT0	CAC CALCIUM DEPOSIT > 0 (0=NO 1=YES)
CTGT200	CAC CALCIUM DEPOSIT > 200 (0=NO 1=YES)
LOGCT	LOG CAC FOR TOBIT MODEL

Spearman Partial Correlation Coefficients, N = 1103
Prob > |r| under H0: Partial Rho=0

	CTGT0	CTGT200	LOGCT
COMINT6A	0.16145	0.15823	0.17082
COMBINED CAROTID IMT YEAR 6	<.0001	<.0001	<.0001

The CORR Procedure

2 Partial Variables: AGE0 male
1 With Variables: ASPIRIN
3 Variables: CTGT0 CTGT200 LOGCT

Simple Statistics

Variable	N	Mean	Std Dev	Median	Minimum	Maximum
AGE0	1205	27.20664	6.91630	27.00000	13.00000	39.00000
male	1205	0.52531	0.49957	1.00000	0	1.00000
ASPIRIN	1205	0.26639	0.44225	0	0	1.00000
CTGT0	1205	0.31037	0.46284	0	0	1.00000
CTGT200	1205	0.08465	0.27847	0	0	1.00000
LOGCT	1205	1.27255	2.14733	0	0	8.12297

Simple Statistics

Variable	Label
AGE0	AGE AT ENTRY INTO DCCT (YEARS)
male	
ASPIRIN	ASPIRIN (>= 14 TABLETS PER MONTH) (0=NO 1=YES)
CTGT0	CAC CALCIUM DEPOSIT > 0 (0=NO 1=YES)
CTGT200	CAC CALCIUM DEPOSIT > 200 (0=NO 1=YES)
LOGCT	LOG CAC FOR TOBIT MODEL

Spearman Partial Correlation Coefficients, N = 1205
Prob > |r| under H0: Partial Rho=0

	CTGT0	CTGT200	LOGCT
ASPIRIN	0.11301	0.10692	0.12984
ASPIRIN (>= 14 TABLETS PER MONTH) (0=NO 1=YES)	<.0001	0.0002	<.0001

The CORR Procedure

1 Partial Variables: AGE0
1 With Variables: MENO
3 Variables: CTGT0 CTGT200 LOGCT

Simple Statistics

Variable	N	Mean	Std Dev	Median	Minimum	Maximum
AGE0	565	26.83186	7.09423	27.00000	13.00000	39.00000
MENO	565	0.23717	0.42572	0	0	1.00000
CTGT0	565	0.20531	0.40429	0	0	1.00000
CTGT200	565	0.04956	0.21722	0	0	1.00000
LOGCT	565	0.80013	1.76852	0	0	7.83016

Simple Statistics

Variable	Partial Variance	Partial Std Dev	Label
AGE0			AGE AT ENTRY INTO DCCT (YEARS)
MENO	0.13338	0.36521	MENOPAUSE (CEASED+PERM) (0=NO 1=YES)
CTGT0	0.15805	0.39755	CAC CALCIUM DEPOSIT > 0 (0=NO 1=YES)
CTGT200	0.04649	0.21561	CAC CALCIUM DEPOSIT > 200 (0=NO 1=YES)
LOGCT	3.02683	1.73978	LOG CAC FOR TOBIT MODEL

Pearson Partial Correlation Coefficients, N = 565
Prob > |r| under H0: Partial Rho=0

	CTGT0	CTGT200	LOGCT
MENO	0.01428	0.06555	0.03169
MENOPAUSE (CEASED+PERM) (0=NO 1=YES)	0.7350	0.1200	0.4525

Spearman Partial Correlation Coefficients, N = 565
Prob > |r| under H0: Partial Rho=0

	CTGT0	CTGT200	LOGCT
MENO	0.01088	0.06228	0.01602
MENOPAUSE (CEASED+PERM) (0=NO 1=YES)	0.7966	0.1396	0.7042

The CORR Procedure

2 Partial Variables: AGE0 male
1 With Variables: PARTYII
3 Variables: CTGT0 CTGT200 LOGCT

Simple Statistics

Variable	N	Mean	Std Dev	Median	Minimum	Maximum
AGE0	1205	27.20664	6.91630	27.00000	13.00000	39.00000
male	1205	0.52531	0.49957	1.00000	0	1.00000
PARTYII	1205	0.17842	0.38303	0	0	1.00000
CTGT0	1205	0.31037	0.46284	0	0	1.00000
CTGT200	1205	0.08465	0.27847	0	0	1.00000
LOGCT	1205	1.27255	2.14733	0	0	8.12297

Simple Statistics

Variable	Label
AGE0	AGE AT ENTRY INTO DCCT (YEARS)
male	
PARTYII	ONE OR BOTH PARENTS WITH TYPE II DIABETES (0=NO 1=YES)
CTGT0	CAC CALCIUM DEPOSIT > 0 (0=NO 1=YES)
CTGT200	CAC CALCIUM DEPOSIT > 200 (0=NO 1=YES)
LOGCT	LOG CAC FOR TOBIT MODEL

Spearman Partial Correlation Coefficients, N = 1205
Prob > |r| under H0: Partial Rho=0

	CTGT0	CTGT200	LOGCT
PARTYII	-0.00433	0.08043	0.00789
ONE OR BOTH PARENTS WITH TYPE II DIABETES (0=NO 1=YES)	0.8807	0.0053	0.7845

The CORR Procedure

2 Partial Variables: AGE0 male
1 With Variables: HBAEL
3 Variables: CTGT0 CTGT200 LOGCT

Simple Statistics

Variable	N	Mean	Std Dev	Median	Minimum	Maximum
AGE0	1205	27.20664	6.91630	27.00000	13.00000	39.00000
male	1205	0.52531	0.49957	1.00000	0	1.00000
HBAEL	1205	9.01177	1.59888	8.76000	6.56000	15.42000
CTGT0	1205	0.31037	0.46284	0	0	1.00000
CTGT200	1205	0.08465	0.27847	0	0	1.00000
LOGCT	1205	1.27255	2.14733	0	0	8.12297

Simple Statistics

Variable	Label
AGE0	AGE AT ENTRY INTO DCCT (YEARS)
male	
HBAEL	HEMOGLOBIN A1C AT DCCT ELIGIBILITY
CTGT0	CAC CALCIUM DEPOSIT > 0 (0=NO 1=YES)
CTGT200	CAC CALCIUM DEPOSIT > 200 (0=NO 1=YES)
LOGCT	LOG CAC FOR TOBIT MODEL

Spearman Partial Correlation Coefficients, N = 1205
Prob > |r| under H0: Partial Rho=0

	CTGT0	CTGT200	LOGCT
HBAEL	0.11798	0.03379	0.12022
HEMOGLOBIN A1C AT DCCT ELIGIBILITY	<.0001	0.2415	<.0001

The CORR Procedure

2 Partial Variables: AGE0 male
1 With Variables: DCCT_HBA
3 Variables: CTGT0 CTGT200 LOGCT

Simple Statistics

Variable	N	Mean	Std Dev	Median	Minimum	Maximum
AGE0	1205	27.20664	6.91630	27.00000	13.00000	39.00000
male	1205	0.52531	0.49957	1.00000	0	1.00000
DCCT_HBA	1205	8.15736	1.39590	7.89000	5.39500	13.57500
CTGT0	1205	0.31037	0.46284	0	0	1.00000
CTGT200	1205	0.08465	0.27847	0	0	1.00000
LOGCT	1205	1.27255	2.14733	0	0	8.12297

Simple Statistics

Variable	Label
AGE0	AGE AT ENTRY INTO DCCT (YEARS)
male	
DCCT_HBA	HEMOGLOBIN A1C MEAN DURING DCCT
CTGT0	CAC CALCIUM DEPOSIT > 0 (0=NO 1=YES)
CTGT200	CAC CALCIUM DEPOSIT > 200 (0=NO 1=YES)
LOGCT	LOG CAC FOR TOBIT MODEL

Spearman Partial Correlation Coefficients, N = 1205
Prob > |r| under H0: Partial Rho=0

	CTGT0	CTGT200	LOGCT
DCCT_HBA	0.09494	0.10080	0.10569
HEMOGLOBIN A1C MEAN DURING DCCT	0.0010	0.0005	0.0002

The CORR Procedure

2 Partial Variables: AGE0 male
1 With Variables: HBAM999
3 Variables: CTGT0 CTGT200 LOGCT

Simple Statistics

Variable	N	Mean	Std Dev	Median	Minimum	Maximum
AGE0	1203	27.20532	6.92149	27.00000	13.00000	39.00000
male	1203	0.52535	0.49956	1.00000	0	1.00000
HBAM999	1203	8.23383	1.58382	8.00000	4.10000	14.00000
CTGT0	1203	0.31006	0.46271	0	0	1.00000
CTGT200	1203	0.08479	0.27868	0	0	1.00000
LOGCT	1203	1.27042	2.14596	0	0	8.12297

Simple Statistics

Variable	Label
AGE0	AGE AT ENTRY INTO DCCT (YEARS)
male	
HBAM999	HEMOGLOBIN A1C AT DCCT CLOSE-OUT
CTGT0	CAC CALCIUM DEPOSIT > 0 (0=NO 1=YES)
CTGT200	CAC CALCIUM DEPOSIT > 200 (0=NO 1=YES)
LOGCT	LOG CAC FOR TOBIT MODEL

Spearman Partial Correlation Coefficients, N = 1203
Prob > |r| under H0: Partial Rho=0

	CTGT0	CTGT200	LOGCT
HBAM999	0.08253	0.07621	0.09013
HEMOGLOBIN A1C AT DCCT CLOSE-OUT	0.0042	0.0082	0.0018

The CORR Procedure

2 Partial Variables: AGE0 male
1 With Variables: EDICMHBA
3 Variables: CTGT0 CTGT200 LOGCT

Simple Statistics

Variable	N	Mean	Std Dev	Median	Minimum	Maximum
AGE0	1205	27.20664	6.91630	27.00000	13.00000	39.00000
male	1205	0.52531	0.49957	1.00000	0	1.00000
EDICMHBA	1205	8.08229	1.15213	7.92000	5.49000	12.71111
CTGT0	1205	0.31037	0.46284	0	0	1.00000
CTGT200	1205	0.08465	0.27847	0	0	1.00000
LOGCT	1205	1.27255	2.14733	0	0	8.12297

Simple Statistics

Variable	Label
AGE0	AGE AT ENTRY INTO DCCT (YEARS)
male	
EDICMHBA	HEMOGLOBIN A1C MEAN DURING EDIC
CTGT0	CAC CALCIUM DEPOSIT > 0 (0=NO 1=YES)
CTGT200	CAC CALCIUM DEPOSIT > 200 (0=NO 1=YES)
LOGCT	LOG CAC FOR TOBIT MODEL

Spearman Partial Correlation Coefficients, N = 1205
Prob > |r| under H0: Partial Rho=0

	CTGT0	CTGT200	LOGCT
EDICMHBA	0.08715	0.04107	0.09203
HEMOGLOBIN A1C MEAN DURING EDIC	0.0025	0.1546	0.0014

The CORR Procedure

2 Partial Variables: AGE0 male
1 With Variables: HBA1C
3 Variables: CTGT0 CTGT200 LOGCT

Simple Statistics

Variable	N	Mean	Std Dev	Median	Minimum	Maximum
AGE0	1205	27.20664	6.91630	27.00000	13.00000	39.00000
male	1205	0.52531	0.49957	1.00000	0	1.00000
HBA1C	1205	7.91643	1.35432	7.80000	4.50000	14.50000
CTGT0	1205	0.31037	0.46284	0	0	1.00000
CTGT200	1205	0.08465	0.27847	0	0	1.00000
LOGCT	1205	1.27255	2.14733	0	0	8.12297

Simple Statistics

Variable	Label
AGE0	AGE AT ENTRY INTO DCCT (YEARS)
male	
HBA1C	HEMOGLOBIN A1C AT VISIT PRIOR TO CT
CTGT0	CAC CALCIUM DEPOSIT > 0 (0=NO 1=YES)
CTGT200	CAC CALCIUM DEPOSIT > 200 (0=NO 1=YES)
LOGCT	LOG CAC FOR TOBIT MODEL

Spearman Partial Correlation Coefficients, N = 1205
Prob > |r| under H0: Partial Rho=0

	CTGT0	CTGT200	LOGCT
HBA1C	0.07429	0.06646	0.08408
HEMOGLOBIN A1C AT VISIT PRIOR TO CT	0.0099	0.0212	0.0035

The CORR Procedure

2 Partial Variables: AGE0 male
1 With Variables: WTMHBA
3 Variables: CTGT0 CTGT200 LOGCT

Simple Statistics

Variable	N	Mean	Std Dev	Median	Minimum	Maximum
AGE0	1205	27.20664	6.91630	27.00000	13.00000	39.00000
male	1205	0.52531	0.49957	1.00000	0	1.00000
WTMHBA	1205	8.11475	1.08370	7.98408	5.71255	12.45611
CTGT0	1205	0.31037	0.46284	0	0	1.00000
CTGT200	1205	0.08465	0.27847	0	0	1.00000
LOGCT	1205	1.27255	2.14733	0	0	8.12297

Simple Statistics

Variable	Label
AGE0	AGE AT ENTRY INTO DCCT (YEARS)
male	
WTMHBA	HEMOGLOBIN A1C WEIGHTED MEAN DURING DCCT EDIC
CTGT0	CAC CALCIUM DEPOSIT > 0 (0=NO 1=YES)
CTGT200	CAC CALCIUM DEPOSIT > 200 (0=NO 1=YES)
LOGCT	LOG CAC FOR TOBIT MODEL

Spearman Partial Correlation Coefficients, N = 1205
Prob > |r| under H0: Partial Rho=0

	CTGT0	CTGT200	LOGCT
WTMHBA	0.10329	0.07798	0.11230
HEMOGLOBIN A1C WEIGHTED MEAN DURING DCCT EDIC	0.0003	0.0068	<.0001